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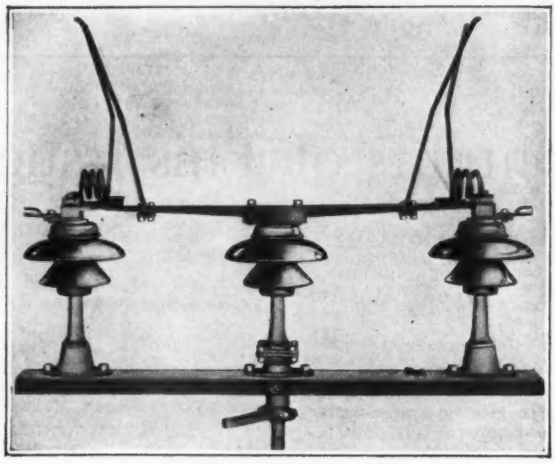

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Electrical World

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W. H. ONKEN, JR.
Editor

VOLUME 91 — *New York, Saturday, February 18, 1928* — NUMBER 7

The Lesson of Careers Like That of William Eglin

MOURNED by a host of friends, W. C. L. Eglin, vice-president and chief engineer of the Philadelphia Electric Company, was laid to rest on Feb. 10. His life's work with the Philadelphia Electric Company, his labors in behalf of the historic Franklin Institute, his contributions to the National Electric Light Association and kindred organizations, as they flash upon the remembrance, all teach a lesson to every one in the industry struggling for his place in the sun. Mr. Eglin started at the bottom as a switchboard attendant and rose step by step to the positions of honor and authority he held at the time of his death. No work was too arduous, no task too exacting for him to undertake. Handicapped at first as all self-made men are, he overcame the difficulties which stood in his way and, under the urge of ambition and in the confidence begotten by years of struggle, he progressed and finally triumphed. What he may have lacked in brilliance he more than made up in service, and it was for service that Philadelphia respected and honored him and that his fellows in the industry admired him. This country abounds with opportunities for those eager and willing to work, and its greatness is predicated as much on the labors of myriads of men who, like Mr. Eglin, have fought "a good fight with all their might" as on the largess that it is able to bestow.

* * * *

Values in Management

BECAUSE of management the light and power industry has grown into mass production of energy, long-distance transmission, interconnection, rural service, industrial applications and home conveniences. It is the product of the energy, the brains and the ideals of the men who direct it, and because of their ability it has grown, continued to extend its service and remained financially healthy. Management is often forgotten in a stock taking of the industry. It is not generally recognized that the material accomplishments so evident on every hand are only monuments to individual enterprise and initiative. Management is responsible for a constantly improved and extended service at a constantly decreased price. The situation has developed a logical succession of engineering and economic steps taken by courageous leaders of men.

Capital requirements of the light and power industry have increased faster than the revenues. But management never hesitated on this account and went ahead with its program for better and more extended service. It offset higher fixed charges by lowering interest rates and operating costs. Mass production and interconnection are characteristic. One pound of fuel in 1927 did as much work as three pounds of fuel did in 1913, and other economies in labor, material and reserve equipment, to say nothing of standardization and concentrated purchases, kept the price of electric service progressively decreasing. Feats of management lie behind the figures and structures that represent the physical assets of the industry.

* * * *

Decentralized Purchasing Seeks Its "Place in the Sun"

CENTRALIZED management is synonymous with headquarters purchasing on many properties. Many economies have been reaped through bulk buying and will continue to be gained in this way, but of late the opinion has been expressed in manufacturing circles that in some cases the pendulum has swung too far away from local executive authority to yield the best all-around results. This viewpoint is not confined to purchasing problems, but appears every now and then in connection with nearly every phase of holding-company management in relation to the conduct of affairs in subsidiary properties. The subject is too large for exhaustive treatment in a few paragraphs, but it is especially important in the readjustment period through which many companies are now passing as a result of the transfer of financial control.

The picture of the headquarters purchasing agent and his supporting technical advisers nonchalantly awarding contracts to equipment and supply manufacturers' executives for a year's requirements of a dozen or two local properties to whose managers little voice in the selection of apparatus and material has been given has doubtless been drawn with exaggerated lights and shades by many who fear that decentralized purchasing has lost its place in the scheme of things. A word of warning has its uses, however. With all the recognized benefits of centralized management—and these are undeniable—it would be most unfortunate if headquarters policies, intentional or otherwise, should be such as to produce the "rubber-stamp" type of subsidiary property executive. Increased responsibility is the key to success rather than diminished influence.

Obviously the crux of the purchasing problem is to obtain the best equipment and material for a given purpose at the lowest over-all cost. The line of solution is sharply defined in the maintenance of close and continuous contact between headquarters and local properties, in inviting advice and suggestions from local executives and staff members as to the choice of material and apparatus for particular needs, in allowing reasonable latitude for routine local purchases, and in co-ordinating whenever possible the demands of scattered systems. Final decisions in important cases may still reside at headquarters; but if these problems are determined along engineering and economic lines, the chances in favor of

awards satisfactory both locally and at the home office of the syndicate will be multiplied. Perhaps the most essential point in the whole affair is that nothing shall be overlooked that will help in making local needs clear to those far from the scene. As time passes adjustments take place which tend to bring about a proper division between centralized and decentralized buying in any particular organization. With a proper approach to the problem and an open-minded desire to meet the conditions most efficiently, neither headquarters men nor local managements nor manufacturers need expect other than successful purchase administration.

* * * *

Serving Two Masters Successfully

NEGLECTING the corporate economy or desirability that may result from combining the electric company and the gas company in the same community, there remains the question of separate or unit service in those instances in which close financial or managerial conditions exist. Many utilities have found it to be desirable to have one trouble gang take care of complaints and emergency work for both electric and gas services. The economies in labor, supervision, equipment, time and money are obvious, but the suggestion is often productive of heated derision from those who have never tried it. Gas men are incredulous of the ability of their otherwise intelligent partners in utility service to comprehend the problems of a kindred activity. Men of the electrical division are, with at least understandable misgivings, dismayed at the thought of a mere gas man being able to grasp the somewhat exaggerated complexities of their field.

Where the electric-gas service-man plan has been tried for any considerable period of time there are few objections manifested. Some interdivision training is necessary, but the difficulties are few and the merits numerous. There are still many opportunities of a similar character in most organizations. The old story of lost hours and energy, of idle dollars, is never downed; it is as always a relative thing and not an absolute one.

* * * *

Another Commercial Contest and a Good One

CONTESTS are one of the oldest forms of sport. It is natural enough therefore that in the field of business the competition idea should have been seized upon as a stimulus to salesmen; and though each new contest is apt to be greeted with the exclamation "What? Another!" it is still a good idea. In the electrical industry the criticism most often has been that the competition was a complicated affair, involving much labor and expense with an intricate scheme for evaluating results. But the "residence-kilowatt-hour contest" announced by the N.E.L.A. Commercial Section is refreshingly simple and appealing. It is a direct drive at a most desired objective. It is open and fair to all. It will entail no extra cost or work either to enter, to participate or to report. And so no wonder that letters are rapidly coming into the merchandising committee from power companies in all sections of the country saying that their sales departments are going to battle for the $9,000 prize money.

In a word, three first prizes of $2,000 and three second prizes of $1,000 are offered to those power companies, classed in three groups, that show the greatest increase in average consumption per residence customer during the year 1928. The groups embrace those companies whose present status might be called backward, average and advanced as concerns the development of residence load. Their achievement for the year will be reckoned by comparing their total average annual consumption for 1927 with the like figure for 1928. Each company will compete in its own class.

Two features of the contest are very appealing. First, as the ratings of the contesting companies are published from time to time, it will focus the attention of each company upon its own average residence consumption. All are ridiculously low when one compares the present possibilities of the market. Some are "plain pathetic." Some companies do not even know what their average is. But before this contest is done many sales managers and executives will have discussed why their company is classed as backward or compares so unfavorably with this community or that, and hurt pride will have goaded much inertia into action.

The fact that the prize money for the contest is being given in small amounts by a large number of manufacturers and others is also excellent. The industry has gone too often to a few large companies for special contributions. This time there will be a long list of subscribers, with nobody burdened and everybody interested. This contest should do a lot of good. Every central-station company should enter.

* * * *

Supervising Power Sales

SUPERVISION of power sales activities varies widely among electric utilities. In some cases the commercial manager is responsible for the work of specialists in motor applications, industrial lighting, heating, rate making and contract drafting. He may have a pretty free hand, coming in contact with executives only for approval of budgets, requests for special reports and general guidance based on their broad knowledge of company development and its larger relations to the communities served. In other instances the power sales head may report directly to the general manager and perhaps maintain contact with a vice-president in the absence of a sales manager. Supervision may be close or elastic.

It is natural for a high-grade man of the type of a trained power sales engineer to function most effectively with a moderate amount of supervision. In a sense, such men are picked officers of the commercial advance guard, and the best results come from permitting them a large degree of freedom. Combat aviators cannot do their best work under the normal rigidities of military rule, and power engineers in their own way need to be free to go and come at will and to attain their objectives largely along their own lines of attack if maximum success is to be realized in customer relations and volume business. This kind of work involves sustained effort without regard to office hours; in fact, it is highly professional in character and as such deserves the privileges as well as the responsibilities of such an occupation.

The responsibility of the power engineer has increased steadily in late years, and his outside contacts and the breadth of his interests are putting him in a position to render more and more useful service to his superiors. His executive does well to expect certain definite results from his service without imposing narrow restrictions

upon how these shall be achieved. On the other hand, executive interest in the work should be active and always in close touch with major negotiations in progress, familiar with the trend of economic studies in the power department, appreciative of when best to join forces with the power sales staff in direct dealings with customers and "prospects," and skilled in guiding the general procedure in harmony with company policies. All this can be done without requiring the executive to become too deeply immersed in detail if the power sales staff prepares first-class reports, summarizing situations with skill and including supporting data for such checking as executives may care to undertake directly or with the aid of outside advice. Unless close supervision, without narrow oversight, is accorded, it becomes difficult for executives to capitalize their own relations with industrial leaders and other important power customers in helping the power sales department to obtain and hold business. On the whole, a very high grade of team work is evident in the power industry in the above directions; sales engineers as a rule have deserved the liberty of action given to them, and apparently the principal opportunity for improvement lies in the direction of more complete economic reports. These are admirably prepared in a host of companies, but in many others are still lacking in comprehensiveness and in "make-up," to borrow a term from the editorial office.

* * * *

How Much Light Does the User Want?

HUMAN eyes evolved outdoors under thousands of foot-candles of daylight. This fact alone points a questioning finger at the intensities of a few foot-candles which generally prevail in artificial lighting. However, to convince the user of light that he needs higher intensities of illumination for efficient work at maximum comfort actual data are necessary. These are being obtained in research laboratories, in factories and other workplaces. The consequence is that progressive executives are beginning to give some attention to the matter of lighting at these higher intensities. Already there are a number of unusual installations. An automobile-body plant is using 50 foot-candles with the so-called tungsten "daylight" lamp. A tile factory employs 150 foot-candles where the product is sorted. A few factories are using 30 to 40 foot-candles, and one large office at least is provided with 25 foot-candles in some places.

As we look back a decade or two we find a steadily increasing tendency toward higher intensities of illumination. Much of this is due to the glowing examples of the productiveness of good lighting. However, there is another very interesting phase—the user's natural tendency to use more light when he can get it. This was recently investigated by a laboratory noted for its researches in lighting and vision. About twenty-five observers were used, and they were permitted to choose independently the intensity of illumination desired for reading. Unknown to the observer, the maximum intensity of illumination available was different on each of five days, ranging from 10 foot-candles to 100 foot-candles. It is interesting to note that the average intensity chosen always depended upon the maximum intensity available For quite a range it was very roughly half the available intensity. The lighting conditions were satisfactory and the intensity of illumination was the only factor which was altered.

From this the interesting conclusion may be drawn that the user will choose to use more light if more is available. With this tendency supported by the demonstrated economic value of good lighting, it should not be difficult to have higher intensities of illumination introduced in most workplaces. Furthermore, the upper limit does not seem to be in sight.

* * * *

New Type of Street-Lighting Rate Desirable

ON THE larger utility systems serving many cities and towns several different street-lighting rates often are in effect. Usually a flat rate per lamp is charged, and the rate is not always logical and equitable. Often the rates are based upon expediency and do not recognize quantity use and other principles entering into costs and rates. A solution has been suggested whereby the street-lighting rate includes a charge for energy based on the prevailing commercial lighting or power rate and another covering maintenance and fixed charges. The resulting rate would recognize demand, load factor and energy consumption—three factors that should enter into all rates. Based upon these charges, a rate per lighting unit could be worked out for groups of 100, 200 and on up to any maximum number of lamps desired. Any city or town would then earn the rate to which it was entitled according to the number of street lamps. The rate could be a matter of published tariff and as easily justified as the commercial lighting or power rate applicable to the particular community.

Utilities are interested in street lighting from many aspects and can well afford to put some thought on rate systems which more nearly reflect the technical and commercial aspects of the art as it exists today. Street lighting can be made good business if it receives adequate attention.

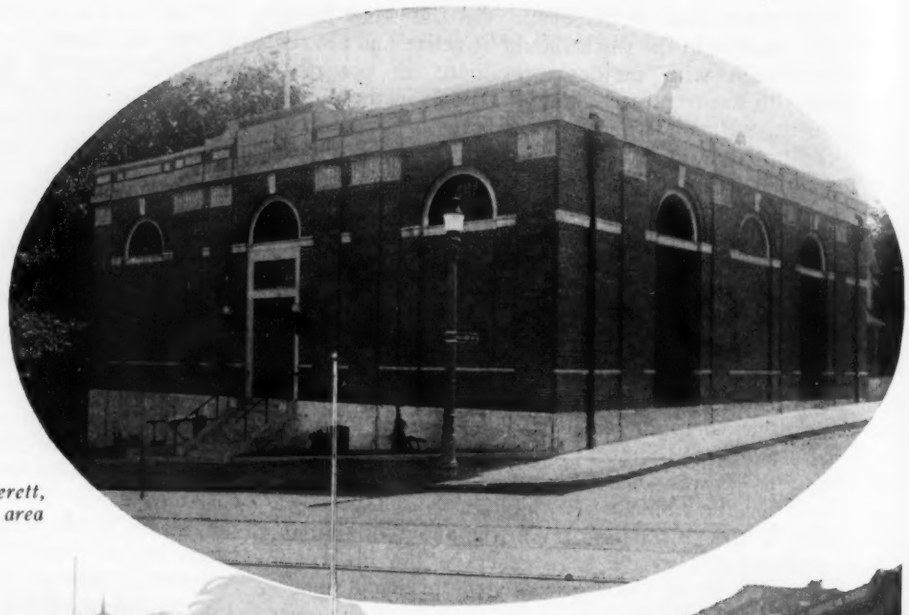
* * * *

Maintenance of Primary Customers' Service Equipment

WHO should take care of the maintenance of transformers and circuit breakers at the plants of industrial customers? The reconditioning of insulating oils and the proper adjustment of contacts and mechanism is as important at one end of the circuit as at the other, yet privately owned equipment goes untouched or incompetently serviced for long periods—often to the point of failure. Except in large installations where a definite provision is made for such work, the industrial plant operators have neither the equipment nor the familiarity with procedure which is requisite for satisfactory results. The job, when recognized as important, is postponed even unto the day of inevitable reckoning. The oil used for replacement has probably stood in containers exposed to a climate of destructive propensities, reclaiming equipment is in the condition induced by disuse, and instruction books are mislaid.

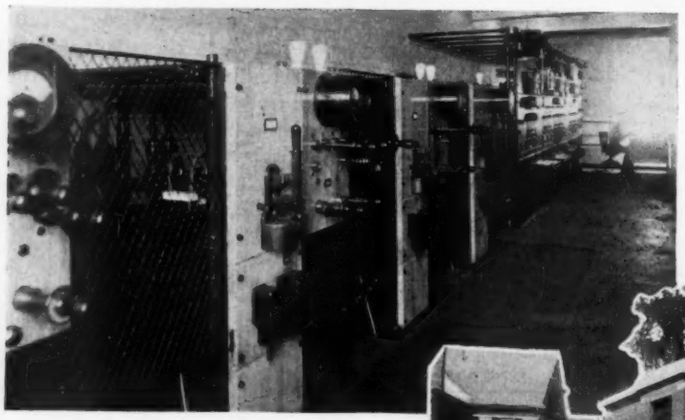
It is one of the many and increasingly numerous duties of the electric light and power companies to advocate definitely, ascertain, and if necessary perform, the servicing of transformers and main breakers in the plants of industrial customers. It takes but little persuasion to convince the customer that the power company should do the job. The cost charged should, if necessary, be nominal. It is a vital and important phase of service.

Modern Construction in North Boston



Broadway substation, Everett, Mass., is in a residential area on a busy highway

Attractive ornamental lighting, Everett, Mass.



Interior of Everett substation shows good design

New Medford substation of Malden Electric Company has pleasing architecture and landscape gardening

Residential Water Heating

Investigation and tests made by the Northern States Power Company in order to serve electric water-heater load at attractive rate and at a comparatively low investment cost per customer

By R. R. HERRMANN and K. R. MCCLUNG
Northern States Power Company, Minneapolis, Minn.

IN NEARLY all range-equipped residences the hot water problem is not satisfactorily solved, especially during the summer months. Customers enjoying the convenience of an electric range also demand some practical means of heating water, and the desire of electric companies to render such service is manifested by their present and past interest in the subject.

An electric water heater will be a relatively large kilowatt-hour user. Assuming an average use of 50 gal. of water per day, heated through a temperature rise of 100 deg. F. (50 deg. to 150 deg. F.), the energy used per month will be approximately 400 kw.-hr. This means that the water heater will use more than double the kilowatt-hours used by the range, lights and appliances combined and will more than treble the present kilowatt-hour consumption of a residence so equipped. Although a large number of kilowatt-hours are used per month, the value of the service rendered will not permit too great a charge except in special cases. A low rate is, therefore, necessary for this class of service.

The operating company has in this class of business a method of increasing its summer load, improving its load factor, using otherwise idle distribution and generation equipment and, at the same time, increasing its net revenue.

A survey of the various types of electric water heaters on the market shows that all makes may be grouped into the following classes:

I—Instantaneous Systems.
  (A) Automatic control.
    1. Large wattage heater; no storage tank.

II—Storage Systems.
  (A) Automatic control; thermostat.
    1. High-wattage circulation type heater; comparatively small tank, fairly well insulated.
    2. Small wattage "immersion" or "clamp-on" heater; large storage tank, well insulated.
  (B) Manual control.
    1. Large wattage circulation type heater; comparatively small tank.

The instantaneous system operating without storage tank and supplying hot water instantaneously must have a heating element of high wattage. If water is drawn at the rate of 1 gal. per minute and is heated from 50 deg. F. to 150 deg. F. the heater will be required to supply 100×8.33, or 833 B.t.u. in one minute. At this rate of consumption about one-fourth of a kilowatt-hour will be used in one minute, which is equivalent to a demand of 15 kw. Obviously, this type of heater cannot be used on residential lines where loads of such size would cause serious voltage fluctuations.

Storage systems of the automatic and manually controlled types have been most commonly used in the past. Circulation and immersion heaters of comparatively high wattage (5,000 watts) have been used in connection with comparatively small storage tanks. Storage systems employing low-wattage heating elements and large storage tanks are of later development.

Since some manufacturers advocate a small heater with a large tank, well insulated, and others a small tank with a large heater, steps were taken by the Northern

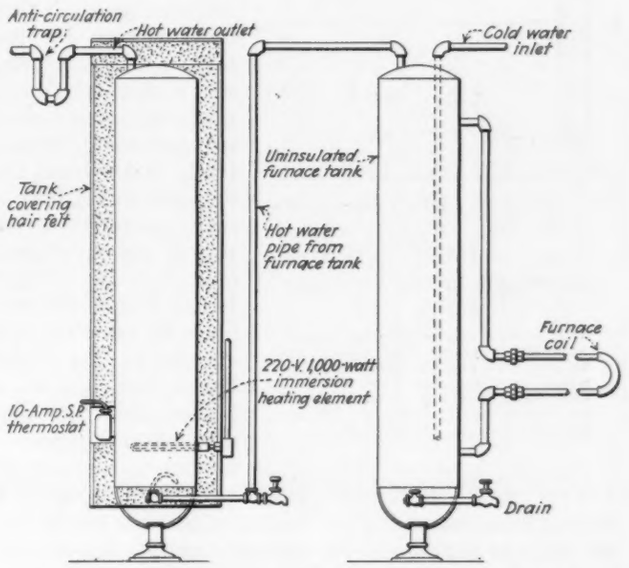


FIG. 1—ELECTRIC WATER HEATER INSTALLED WITH FURNACE TANK

States Power Company to ascertain, if possible, what sort of water heater should be advocated and sold to its customers at the present time. The high-wattage circulation type of heater, being the type most largely in use, naturally was given first consideration. Data on installations of this type indicated that there would be little improvement in load factor resulting from its use. Furthermore, with heaters of this type, either manually or automatically controlled, it was felt that even with a large diversity in use the average peak demand would be too large to merit a low rate. Accordingly, an attempt was made to devise a system which would have a good load factor and little peak responsibility.

Having in mind the desirability of a good load factor, and at the same time the satisfaction of the customer, the following method of water heating was suggested:

Two heating elements, one of small capacity, approximately 150 watts, and the other of large capacity, possibly 3,000 watts, were to be used. The small element was

to be located at the bottom of the storage tank and to be in operation continuously. The large heater was to be placed in a circulating pipe along the side of the tank and was to be turned on manually, with a suitable means for turning it off, either when the temperature of the water reached the desired point or after a certain time had elapsed. The idea back of this suggestion was that the small heater would supply the radiation losses of the tank and would just equal these losses when the temperature of the water reached 220 deg., which would be the condition when no water was withdrawn from the tank for a period of a day or so, thus eliminating any temperature control for the small element. Since the small element would, therefore, give a 100 per cent load factor, it was felt that the energy for the same could be sold very cheaply. Since the large heater would be operated intermittently throughout the day and would have a much poorer load factor, it seems reasonable that this large heater should not deserve the same rate for energy as the small heater, but, instead, a higher rate. The rate schedule in Minneapolis has a low step of 3 cents per kilowatt-hour with 5 per cent discount for prompt payment, and it was suggested that the energy for the large heater should be metered through the regular house meter and thus be billed at the 3-cent rate.

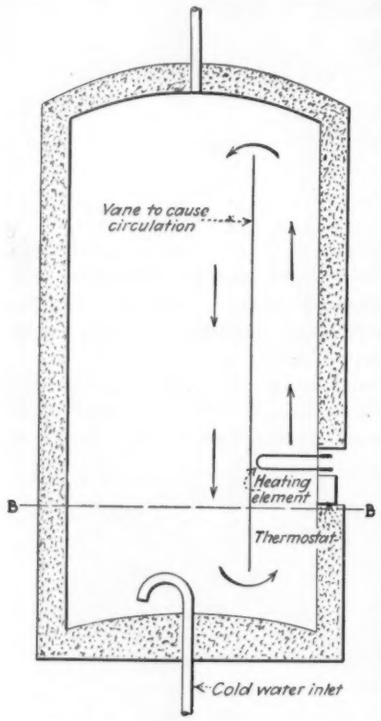


Fig. 2 — Cross-section of electrically heated tank with circulation plate

Note.—When sufficient water is used to bring cold water up to line *BB*, the thermostat operates, turning on the heating element. Heating element stays on until portion below *BB* is heated, due to circulation.

Accordingly, several installations were made in the homes of employees along the lines suggested. With the small heater just large enough to take care of radiation losses, it was found that the large heater (3,600 watts) was being used so frequently that the customer's bill at the rates suggested above would be too great to promote the business.

Tests on Types of Water Heaters

Discussion of the system raised the point regarding the relation between the kilowatt-hours consumed by the large size heater and the size of the small heater. If the small heater were increased in size from 150 watts to 500 watts or so, besides supplying the radiation losses, this small heater would supply an additional amount of hot water, thus reducing the number of times which the large heater would be used. In this case, however, it would be necessary to have the small heater thermostatically controlled, since the temperature of the water would rise to an unduly high point if little or no water were used during an interval of a day or more.

In order to ascertain what size of small heater would supply the majority of requirements the large heater (3,600 watts) in the side arm circulating pipe of several installations was then placed in automatic operation, turning on when the temperature of the water fell to a certain point and turning off when a certain temperature had been reached. Fig. 4 shows the variation in the temperature of the water in one tank during a 24-hour period with this arrangement.

It will be seen that there is a great variation in the temperature of the water as recorded by a thermometer placed 4 in. from the top of the tank. This is due to the fact that the thermostat controlling the large heater was placed at the bottom of the tank and the circulation of water was not free enough to keep a more even temperature between the bottom and the top.

The wattage of the large heater was next reduced to 1,800 and the small heater was left the same as before and, also, in operation continuously as before. A temperature and demand chart are shown in Fig. 5. There is not as great a variation in the temperature of the water as before, which is probably accounted for by the fact that as rapid circulation as before was not required to distribute the temperature.

The improvement in the operating conditions shown by this last arrangement suggested reducing the size of the large heater from 1,800 to 900 watts, leaving it thermostatically controlled as before. A temperature chart is shown in Fig. 6 and is a considerable improvement over the temperature chart shown in Fig. 5. Besides the improvement in the temperature chart, there is also an improvement in the load factor over the previous two conditions of operation, as may be noted by referring to the demand charts.

It will be noticed that under the last condition of operation the wattage of the two heaters combined is close to 1,100. In this particular installation the tank was a 30-gal. tank covered with 2 in. of hair felt. The radiation loss of the tank alone amounted to approximately the capacity of the small heating element. The radiation loss of the large heater in the circulating pipe was, however, a considerable amount, being approximately 125 watts. The small immersion heater was next increased in size to 800 watts and was controlled by the thermostat. The circulation, or 3,600-watt heater, was rewired so that it was manually controlled, the idea being to find out how often this large heater would be turned on to take care of such cases when all water would have been withdrawn from the tank and more hot water desired immediately. Fig. 7 shows a temperature chart of the water, and the accompanying demand chart shows that the large heater was not turned on during this period, which means that the 800-watt heater supplied all of the hot water used by this household during the 24 hours. Charts taken over a two-week period show that only twice during this time was it

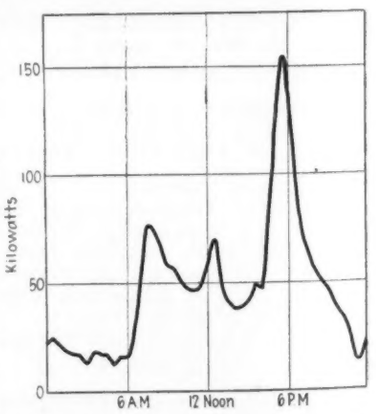


FIG. 3—LOAD CURVE OF RESIDENCE DISTRICT, 85 CUSTOMERS, OF WHOM 75 ARE RANGE USERS

Temperature and demand charts show effect of different methods of control and types of heaters

Fig. 4—Gallons of water consumed, 75; kilowatt-hour consumption circulation heater, 22; kilowatt-hour consumption immersion heater, 4; total, 26.

Immersion heater (187 watts) in operation continuously. Large heater (3,600 watts) controlled by thermostat operating between 90 deg. and 120 deg. F.

Fig. 5—Gallons of water consumed, 90; kilowatt-hour consumption circulation heater, 20; kilowatt-hour consumption immersion heater, 5; total, 25.

Immersion heater (187 watts) in operation continuously. Circulation heater (1,800 watts) controlled by thermostat operating between 90 and 120 deg. F.

Fig. 6—Gallons of water consumed, 67.5; kilowatt-hour consumption circulation heater, 16; kilowatt-hour consumption immersion heater, 5; total, 21.

Immersion heater (187 watts) in operation continuously. Circulation heaters (900 watts) controlled by thermostat operating between 90 and 120 deg. F.

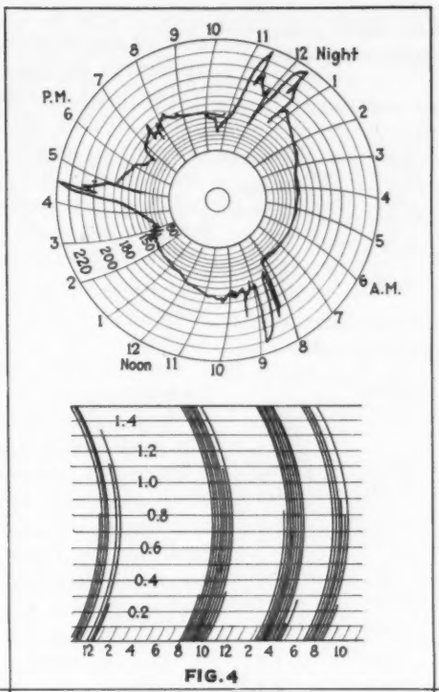


FIG. 4

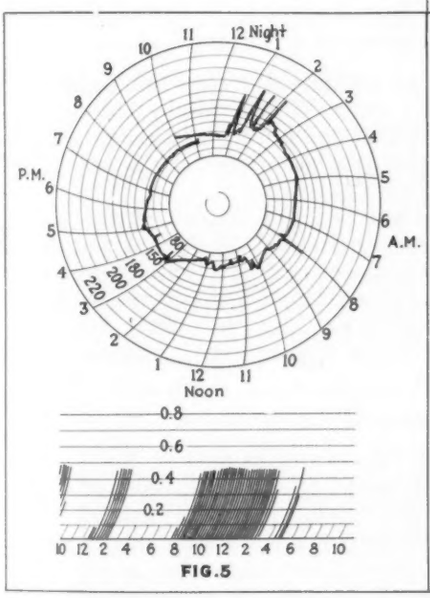


FIG. 5

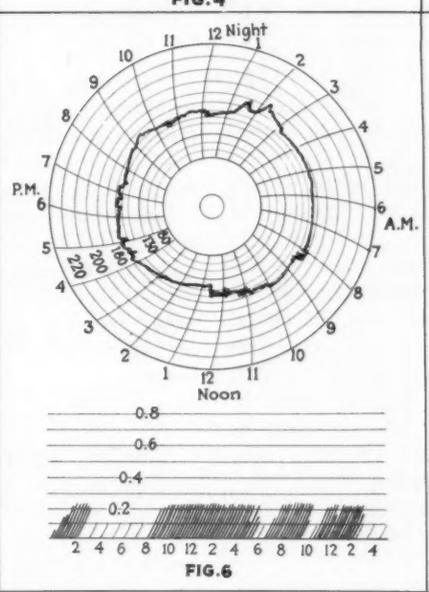


FIG. 6

Fig. 7—Gallons of water consumed, 67.5; kilowatt-hour consumption immersion heater, 19.

Immersion heater cut to 800 watts. Operation controlled by thermostat operating between 90 and 120 deg. F.

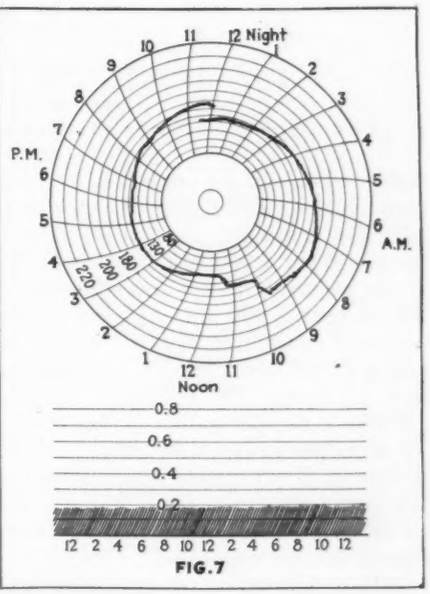


FIG. 7

necessary to utilize the 3,600-watt circulation type water heater.

If the size of the tank had been 60 gal. instead of 30 and had been well insulated it is doubtful whether the large heater would have been turned on at all during the two-week period. This led to the recommendation that for the time being a 1,000-watt heater would be supplied with a well-insulated tank of fairly large capacity. Installations made along these lines during the spring and summer have resulted in no complaints whatever.

Table I shows more in detail the results of the tests described above. It will be seen that the 800-watt immersion heater supplied all of the hot water required, even though the 3,600-watt heater remained in the circulating pipe, with its consequent radiation loss. This customer is a rather large user of hot water. Other installations show a consumption as low as 30 gal. per day.

Table II shows the kilowatt-hours consumed by five customers selected at random. Each of the tanks was equipped with a 1,000-watt immersion heater automatically operated, to cut out when the water reached a temperature of about 150 deg. Several thermostats set to operate at about 175 deg. caused complaints of water being too hot, so they were reset to operate at 150 deg.

In deciding upon the proper rate and apparatus for supplying household requirements, the following conditions must be carefully considered: First, the value of the service to the customer necessitates a low rate for energy; second, hot water service, not electric, is desired by the customer; third, for a given hot water use a certain number of kilowatt-hours must be supplied during any given period and the time during which these are supplied directly affects the cost to both customer and company.

In comparing electric heating with other forms, such as gas, oil, coal or wood, it must be remembered that the thermal efficiency of the electric heater is the greatest. Other systems require a vent pipe to carry the burned gases while in operation and, at the same time, cool the

TABLE I—COMPARISON OF TEST RESULTS ON ELECTRIC WATER HEATERS AND CONTROL

(30-gal. tank; 2 in. hair felt covering; three persons in family)

Size of Immersion Heater, Watts	Size of Circulation Heater, Watts	Control of Immersion Heater On	Control of Circulation Heater	Kw.-Hr. per Day of Immersion Heater	Kw.-Hr. per Day of Circulation Heater	Length of Test, Days	Gallons of Water per Day
187	3,600	Continuously	Thermostat	4.33	20.33	6	52.5
187	1,800	Continuously	Thermostat	4.7	15.66	16	67.0
187	900	Continuously	Thermostat	4.8	18.00	10	72.8
800	3,600	Thermostat	Manual	18.6	0	5	70.5

TABLE II—ENERGY USED BY FIVE ELECTRIC WATER HEATER CUSTOMERS

(Each equipped with 1,000-watt immersion heater)

Customer	No. in Family	Size of Tank in Gallons	Period	Kw.-Hr.	Kw.-Hr. per Day
A	3	30	July 11–Aug. 11	344	11.1
B	4	30	July 28–Sept. 9	359	8.3
B	4	30	Sept. 9–Oct. 10	235	7.6
C	4	60	June 7–July 9	518	16.2
C	4	60	July 9–Aug. 10	488	15.2
C	4	60	Aug. 10–Sept. 15	676	18.8
D	4	30	Sept. 15–Oct. 26	473	11.5
E	3	30	Sept. 14–Nov. 8	857	15.6
F	3	60	June 13–July 13	129	4.3
F	3	60	July 13–Aug. 12	93	3.1
F	3	60	Aug. 12–Sept. 14	109	3.3
G	4	40	June 16–July 13	363	13.4
G	4	40	July 13–Aug. 15	319	9.7
G	4	40	Aug. 15–Sept. 14	218	7.3

water when not in operation by cold air being drawn through the coils because of the vent pipe. This may be partially controlled. Suppose, however, that gas sells for $1.50 per 1,000 cu.ft. and has a heating value of 500 B.t.u. per cubic foot. Assuming a thermal efficiency of 50 per cent, 3,400 B.t.u. (1 kw.-hr.) will cost 2.1 cents. Suppose again that the gas heater is of better design and is 75 per cent efficient. In this case 3,400 B.t.u. will cost 1.3 cents. Or, take oil, having a heating value of 140,000 B.t.u. per gallon at 50 per cent efficiency and at 10 cents per gallon, 3,400 B.t.u. will cost 0.5 cent. The difference is, of course, much more marked in this case, but when one considers the almost insignificant number of oil heaters in gas districts the competition from this source is also negligible.

About 833 B.t.u. are necessary to raise the temperature of one gallon of water 100 deg. F., which means slightly more than 4 gal. per kilowatt-hour. At 50 gal. per day the kilowatt-hours per month will be about 400, exclusive of any radiation losses. Unless the rate is lower than 2 cents, the cost will be greater than the majority of people will care to pay, especially when the cost of electrical equipment exceeds that of gas-operated apparatus, as it usually does.

The total cost to the customer, however, includes the initial cost of the equipment. What can be reasonably invested in a storage tank will, of course, depend upon two factors: (1) How many gallons of water will the customer use per month, and (2) what rate must he pay for electrical energy?

The cost to the utility can likewise be segregated into (1) fixed costs, due to increase in local and general investment, and (2) variable costs, depending upon the amount of hot water used.

It is at once apparent that these two parties to the transaction are in opposition. For example, from the central station viewpoint the most desirable water heating load would be during the valleys of the load curve. This would necessitate (1) a large storage tank and (2) clock-switching mechanism or the equivalent. An electric heater of large capacity would require the smallest tank and no clock mechanism. It would, however, require additional investment in transformer and generator capacity and in wires. The question to be decided, then, is: What size heater and tank is the most economical for the customer, since he is the one who pays the cost ultimately.

Cost to the Utility

Assuming that all equipment inside the customer's dwelling, except the meter, is paid for by him and all other cost is paid for by the utility, an attempt will be made to discover what size heater and tank is the cheapest, all things considered.

The assumption will be: (1) 50 gal. of hot water per day; (2) water heated from 50 deg. to 150 deg.; (3) each residence equipped with an electric range; (4) a peak load of a group of range-equipped residences to occur between 5 and 6 p.m., and to total 1 kw.; (5) an insignificant residential load between 12 midnight and 6 a.m.

Comparison of Methods

The first method (designated as method No. 1) considered is the supplying of sufficient kilowatt-hours between midnight and 6 a.m. to heat 50 gal. of water 100 deg. and to supply radiation losses. This means heating the water to a somewhat higher temperature than 150 deg., since the temperature will constantly fall during the other eighteen hours due to radiation losses to the air and the cooling effect of the incoming cold water.

The cold water will, of course, enter the bottom of the tank and hot water will be drawn off at the top. Turbulence of incoming cold water as well as heat con-

TABLE III—VARIATION IN DEMAND AND COST TO SUPPLY 200 TO 1,200-WATT HEATERS

Size of Small Heater (Watts)	Hours Small Heater Is On	Kilowatt-Hours Supplied by Small Heater	Kilowatt-Hours Supplied by 3-Kw. Heater	Kilowatts–Demand of Small Heater	Kilowatts-* Station Demand of Large Heater	Kilowatts Total Station Demand	Investment of Company at $200 per Kilowatt	Investment of Customer and Company
100	24.0	2.4	12.6	0.1	0.70	0.8	$160.00	$405.00
200	24.0	4.8	10.2	0.2	0.57	0.77	154.00	400.00
300	24.0	7.2	7.8	0.3	0.43	0.73	146.00	391.00
400	24.0	9.6	4.4	0.4	0.24	0.64	128.00	373.00
500	24.0	12.0	3.0	0.5	0.16	0.66	132.00	377.00
600	24.0	14.4	6	0.6	0.03	0.63	126.00	371.00
700	21.5	15.0	0	0.6	0	0.6	120.00	365.00
800	18.8	15.0	0	0.6	0	0.6	120.00	365.00
900	16.7	15.0	0	0.6	0	0.6	120.00	365.00
1,000	15.0	15.0	0	0.6	0	0.6	120.00	365.00
1,100	13.6	15.0	0	0.6	0	0.6	120.00	365.00
1,200	12.5	15.0	0	0.6	0	0.6	120.00	365.00

* Assumes necessary killowatt-hours supplied during eighteen hours of the day.

duction will cause a considerable lowering of the temperature. There will be very little convection currents, since the hot water is already at the highest point. To keep the conduction from the top 50 gal. as small as possible, an additional 25 gal. of capacity should be provided. This means a 75-gal. tank. Radiation losses for a well-insulated tank of this size will be about 75 watts and for a poorly insulated tank three times this amount and more. The kilowatt-hours to be supplied per day will then be 12.5 for raising the temperature of the water and about 2.5 for radiation losses, making a total of 15 per six hours, or 2.5 kw. capacity. Since the demand of a group of residences was assumed to be 1 kw., the peak demand will now be 2.5 and will occur between midnight and 6 a.m. While this may be of no consequence to companies having a large power load in the daytime, it may be to companies having a large portion of their load residential. Considering the residential business by itself, 1.5 kw. of additional capacity must be provided or set aside for water heating. At $200 per kilowatt, this means an investment of $300 on the part of the company. The customer will have an investment of approximately $250, including tank, clock-switching mechanism and the installation of the same. The total cost of the service will then be 1 per cent of $550 monthly, or $5.50 plus 450 kw.-hr., at an assumed cost of 1 cent per kilowatt-hour, or $4.50, making a total cost of $10 per month.

Two-Heater and Relay Combinations

The second method will be designated as the two-heater method, which was described previously and which consists essentially of the following: A heater of small wattage, on continuously except when disconnected by a thermostat when all water in the tank is at 150 deg., and a manually operated auxiliary heater of 3-kw. size, also disconnected by a thermostat when the entire contents of the tank are at 150 deg.

In Table III is shown the variation in cost with small heaters varying from 200 to 1,200 watts, assuming the water to be used by a group so that no peaks will result. This is not the case, however. Each residence will use hot water for dishwashing after mealtimes, so that the majority of small heaters will be on the line at that time. The heaters of 700 watts and larger will, therefore, cause a demand greater than 0.6 kw., as shown in Table III.

This feature, however, can be eliminated to a certain extent by a contrivance which would not turn on the heater until 10 gal. or so of hot water is withdrawn from the full tank and which would not turn off the heater until the entire contents of the tank are heated. By placing the small heater, say, one-third the length of tank from the bottom, inserting the thermostat about 1 in. below the heater and providing a plate or pipe is inserted so the water heated will immediately rise to the top of the tank, that is, circulate, this feature can be accomplished. This is shown in Fig. 2.

The third method is a modification of method No. 1 and consists in permitting the heater to be connected a greater number of hours per day. By placing a relay in the range circuit which will operate when one element of the range is in use it can be made to disconnect the water heater when the range load is, for example, 1,000 watts or more. Load curves of residence districts equipped with electric ranges will show the peak to occur between 5 and 6 p.m. (see Fig. 3). A relay such as this would then keep the peak caused by water heaters down to a very low amount per heater. If the relay were set to operate at 500 watts the peak would not be increased as much. There is one point which must not be overlooked at this time, and this is that a considerable amount of water for dishwashing at the present time is heated on the electric range. A water heater will, therefore, take this range load away from the range and give it to the heater. Assume that the large element of the stove, say 1,500 watts, is used for heating water for dishwashing and the water heating element is only 1,000 watts, there is a direct reduction of 500 watts. This reasoning leads one to believe that a contrivance which will disconnect the water heater when the range is in use will probably lower the peak caused by ranges; at least it will not increase it.

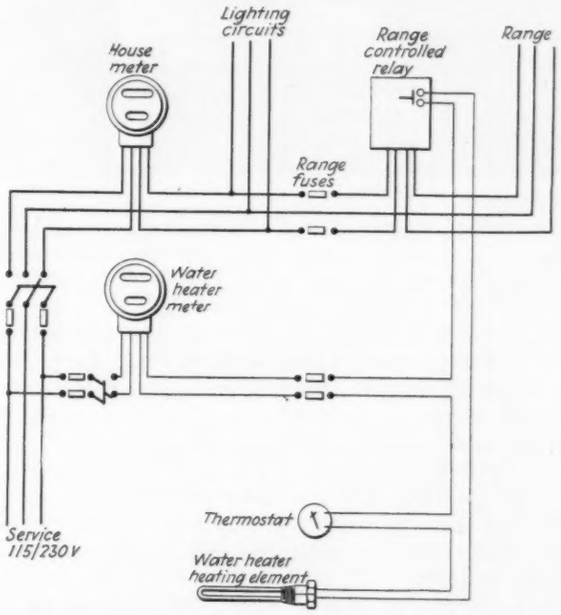


FIG. 8—SWITCHING CONNECTIONS FOR METERING AND CONTROLLING ELECTRIC WATER HEATERS

Referring to the tank shown in Fig. 2, it may be well to mention that experiments made on tanks with the heater located inside of a metal pipe, which is in turn located in the center of the tank, show very little circulation with a 1,000-watt heater. This is due possibly to the condition whereby the metal pipe conducts the heat to the surrounding water so fast that there is no tendency toward circulation. When a 3,000-watt heater was used the water circulated, showing that the conduction of heat was too slow to keep the temperature of the water in the inside pipe from rising. The inside pipe or vane must, therefore, be constructed of other material, something which will conduct heat very poorly, if a 1,000-watt heater is to be used. No experiments along this line have as yet been made by the writers, but the advantage of this scheme appears to be of sufficient importance to warrant experiments.

Load Characteristics

The reason for assigning importance to this feature is apparent by referring to the daily load curve of a district equipped with ranges. The demand of this group of residences rises rapidly at 4 p.m., reaches a peak at 5:30 and then drops to its former value at about 8 p.m. With a relay in each range circuit to disconnect the water

heater when 1,000 watts of range capacity is in use the residence demand between 4 and 8 p.m. may increase, due to the water heaters. Although the heater in any one residence may be disconnected, nevertheless the range in the residence next door may not be in use and its water heater may be on, resulting in 1,000 watts more in demand than would obtain if no water heaters were installed. By imposing the condition that 10 gal. or more of water must be withdrawn from a tank completely filled with hot water before the heater will again be turned on, the chances of an increase in demand becomes extremely remote. The range relay will then accomplish what a clock-switching mechanism would and at much less expense.

Value of Range Relay

Such a scheme immediately eliminates any demand charge. The only expense is the manufacturing cost of the energy, together with the copper losses between the power house and the heater. Since this cost is in the neighborhood of 0.5 cent per kilowatt-hour for large plants, a rate of 1.5 cents less 5 per cent leaves a very good margin.

The wiring diagram for the above method is shown in Fig. 8. Assuming twenty hours per day, this method will supply 600 kw.-hr. per month. A tank sufficient to take care of peak requirements must be provided. Opponents to this scheme may ask why not use a small tank with a large heater (3 kw. or more), manually operated. This can be done, but it must be remembered that under the manually operated system a demand charge must be made against the water heater. The heater demands will occur between 6 a.m. and 12 p.m. with the manually operated, whereas with the automatic small heater with the large tank a goodly portion will be sold by the utility between midnight and 6 a.m., a highly desirable feature.

Customers should still be given the privilege of installing a large heater, energy for which is to be measured on house lighting and range meter and, hence, pay a higher rate. Some customers may prefer to do this. In general, however, the extra expense of installing a large heater as an auxiliary, together with the necessary heavy wiring and switches, is far more than the additional cost of a large storage tank, to say nothing of the added inconvenience and extra charge for energy necessary.

Water Heating an Attractive Load

For the sake of argument, assume that a 3-kw. manually operated heater will use only 300 kw.-hr. per month. A company would be obliged to charge between 2½ and 3 cents per kilowatt-hour for this energy. This would cost the customer from $7.50 to $9 per month. Then assume a 1-kw. heater operated in conjunction with a "peak-limiting" relay. The radiation loss of 50 kw.-hr. would be supplied in addition to the 300, making 350. At a low rate of 1.5 cents per kilowatt-hour, the cost for energy would be $5.25, which is $2.25 to $3.75 per month less. Assuming a use of only six months during the year gives $20 approximately, which is very good interest on $100 additional investment.

When a customer desires to use a tank having a heating coil in the house furnace the electric heater should be placed in series with the furnace tank, the hot water outlet pipe of the furnace tank entering the electric tank at the bottom, as shown in Fig. 1. When the water is not sufficiently heated by the furnace coils the electric heater will operate. The customer will thus be assured of hot water of about the same temperature all year around and the company will have no worry about demands caused by the water heaters in those cases where the winter load is larger than the summer.

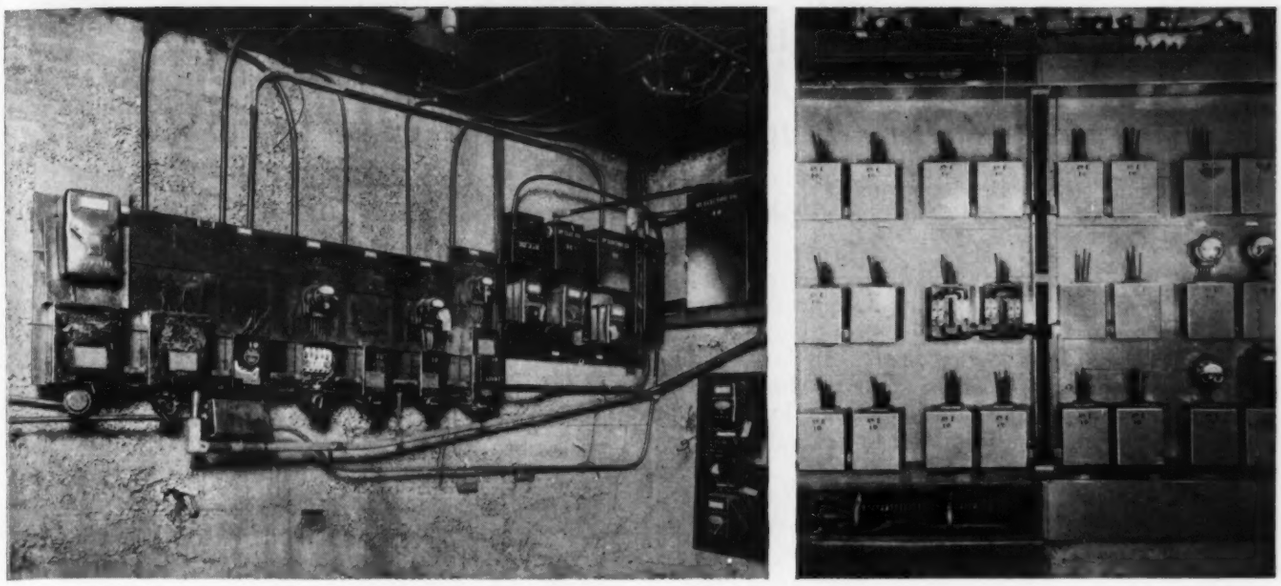
There will be cases arising where the 1,000-watt heater will not be large enough on the average, which can be ascertained by noting the amount of energy used by the heater. In such cases the size of the heater can be increased and an extra charge per kilowatt per month made. In case the complaint is due to an abnormal use at some particular time, the size of the tank can be increased. This can be ascertained by noting the kilowatt-hours consumed.

Referring again to Fig. 3, which is the load curve of a district having about 85 residences, with ranges in 75 of them, and assuming, also, 75 water heaters of 1,000 watts each, the demand between 6 a.m. and 4 p.m. will not be increased to more than 150 kw., the peak at 5:30 p.m. Since the water heaters will not be on at 5:30, there will be no increase in peak of the district due to the heaters.

In time to come, when the average use per residence becomes more than 1,500 kw.-hr. per year, it may be desirable to increase the size of the heater from 1 to 5 kw. All secondary distribution lines will have been increased to take care of the heavy demand for energy under such great use, and the diversity of the water heaters will cause little increase in station demand. The supplying of energy to a small heater during the night hours is especially attractive and, for that reason, is being tried out at this time.

Transformer Data Plate Placed on Pole

TO facilitate field checking of transformer capacities, voltage rating and serial numbers and to aid in distribution of load and laying out of extensions, the Southern Sierras Power Company, Riverside, Cal., places transformer data plates on transformer poles as shown in the accompanying illustration. The plates are stamped by the company to indicate manufacturer, rating, serial number, type, phases and high- and low-tension rating. The blank plates cost 8 cents each and it is estimated that the total cost stamped and installed will not exceed 25 cents each. The Southern California Edison Company uses a similar plate for pole-type oil circuit breakers as well as for distribution transformers.



Old and new type of underground service and meter installation in Portland

Wire runways with removable covers replaced nipples, adding to the appearance and flexibility of the installation without increasing the cost

Iron-Clad Services Protect Against Theft

By S. B. Clark

Superintendent Underground Northwestern Electric Company, Portland, Ore.

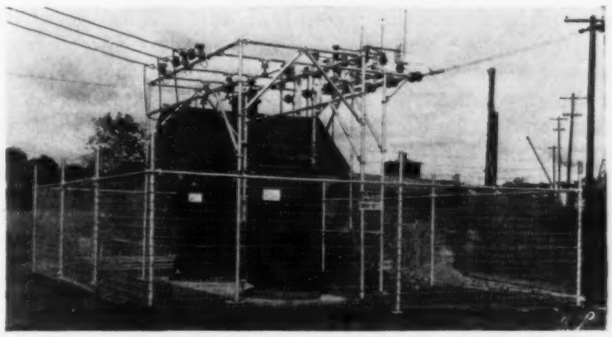
FOR a number of years the Northwestern Electric Company, Portland, Ore., has followed the practice of making an "iron-clad" type of underground service and grouped meter installation, primarily to protect against current theft, but also for convenience and economy in reading and testing meters.

Earlier installations were of the type shown in the left-hand view in the accompanying illustrations. This consisted of standard steel cabinets connected with pipe nipples. Service cables from the street enter the large cabinet containing the mail line switch shown at the upper right-hand side of the illustration. Rubber-covered wires were carried from one meter position to the next through the pipe nipples. Taps were taken off for each meter and fuses of proper size were provided for the several tenants. This type of construction became very inflexible as time passed when a new tenant with greater current requirements occupied an old location with small fuses. While the feeders from the main line switch are installed with capacity to care for a 50 per cent increase in load, frequently it was found less expensive to abandon the old meter position, with consequent additional expense to the serving company in changing the customer's feed wires, rather than attempt to increase the size of the box to take larger fuses.

These objections have been overcome in the newer type of installation, shown in the right-hand illustration. Here each position will accommodate a load varying from 50 watts to 50 kw., with a maximum cost for the change not to exceed $10. Open 240-volt copper buses are supported on transite blocks in the large horizontal gutter at the bottom. Holes are drilled in the buses for the maximum number of positions the board will care for. Cabinet covers and wire-ways are removable. The nipples between boxes in the old type installation are replaced with short square wire-ways with snap-on covers and are bonded to the boxes with stove bolts. In wiring this type of installation measurements of wires can be taken, lugs sweated on and all wires then laid in place, after which the covers are placed on. Feed wires to the various customers are usually passed from the meters through the vertical wire-ways to a collecting gutter at the top of the board which contains a neutral bus.

Material for this type of installation is more expensive than the old, but the total cost is less, due to a reduction in the unit labor cost per meter from $5.50 to $2.50. Moreover, the new type requires only 2.75 sq.ft. per meter, as against 4.3 sq.ft. for the old, which is an item of importance where space is valuable. In the newer type of construction a make of fused test block is used which permits meters to be tested without interrupting service.

Simplicity a Feature of 13,000-Volt Outdoor Substation



THE 13,000-VOLT outdoor Brookhaven (Miss.) substation of the Mississippi Power & Light Company is constructed largely of 2½-in. galvanized-iron pipe. Space requirements have been minimized without sacrifice of clearance or working space and construction economies have been realized. Transformation is from 13,000 to 2,300 volts

Reducing Distribution Losses

EIGHTH ARTICLE

Graphic Voltmeter Tests

By J. B. Moorhouse
Electric Distribution Engineer Central Illinois Public Service Company, Springfield, Ill.

A COMPLETE voltage survey of an electric distribution system of a town or city requires the use of graphic voltmeters which must be placed on all primary phases at the source of energy supply. By keeping these instruments running throughout the test a check of regulation of the supply voltage is obtained. Furthermore, these charts are necessary in order to determine primary voltage drop at any time during the test.

Our graphic voltmeters are set at the ends of secondaries farthest from the transformers, at points of heaviest load and at points where voltage complaints have been turned in. To separate secondary loss of voltage from primary it is necessary also to set a voltmeter at the terminals of the transformer which supplies the secondary system under test. To avoid setting a voltmeter at each transformer under test two or more voltmeters may be set at points of heaviest loading, connecting them to the primary lines through potential transformers. By keeping these instruments running throughout the test an appreciable amount of time may be saved. Also, a smaller number of voltmeters is required when using this method.

GRAPHIC VOLTMETERS INSTALLED IN PORTABLE METAL CASE ON POLE

Charts are taken at different seasons of the year and for different lengths of time, depending on the nature of the load and the amount of information required. For example, a voltage check in a business district must always include the Saturday night lighting load. Voltage complaints caused by excessive range and appliance load connected to lighting secondaries are not likely to occur during the summer months, even though the cooking load is heaviest at that time. Much reconstruction work can be laid out with the guidance of voltmeter charts. The checking of new and rebuilt distribution facilities with graphic instruments furnishes an excellent record for future reference in case trouble arises on these systems.

The accompanying illustration shows a steel test box containing two type "U" graphic voltmeters connected so as to record the voltage on each leg of a transformer secondary. The box is securely and easily fastened to the pole by a chain which is wrapped completely around the pole. It is mounted low enough to permit access from the ground for attending the instruments. The box is weatherproof and has a fairly tight door. Sufficient heat is given off by the instrument resistors to prevent the clocks from stopping due to cold weather. Connection may be easily made to the overhead secondary circuits by employing a four-conductor cable fitted with clamps, which may be attached to the wires.

Safeguarding Operators of Mercury-Vapor Turbine Units

By T. H. Soren
Vice-President Hartford (Conn.) Electric Light Company

THE Hartford Electric Light Company is at present installing in its South Meadow generating station one 10,000-kw. mercury boiler and turbine. The pioneer installation made by this company at its Dutch Point station had a capacity of about 1,800 kw. and its operation was highly satisfactory and economical. We obtained from this all the necessary information and experience to warrant the installation of a larger unit and we have abandoned the operation of the small unit. The new unit will give 10,000 kw. from the mercury vapor and in addition approximately 125,000 lb. of steam per hour at 260 lb. pressure superheated to a temperature of 700 deg. F.

Many inquiries have been made regarding the safety of this process. No chronic cases of mercury poisoning (due to continuous absorption of small amounts of mercury into the system) have occurred because the room in which the turbine was installed was well ventilated. A few acute cases of poisoning resulted from men entering the condenser when it was hot and thus being subjected to mercury vapor from leakage or other causes. Both possibilities have been eliminated by the design and construction features involved in the new installation.

None of the cases of poisoning we had in the pioneer installation was serious and the men recovered within a very short time with fresh air and a little outdoor exercise.

The walls of the building will be hard-finished surfaces, so that in case of leakage any mercury can be flushed down with water. All hot parts of the mercury turbine and piping will be inclosed with light sheet iron and wire glass openings for inspection and a slight suction will be maintained from the inclosure to the stack. Any leakage will thus be drawn up the stack and will not enter the operating room.

During extensive repairs or inspection, there is liable to be a certain amount of mercury spilled or opened to the atmosphere, and under such conditions our operators or mechanics are expected to wear masks. If work is to be done requiring heat, such as welding or expansion of wheels by gas flame, it is necessary for the operators to wear masks.

The General Electric Company has developed a paper which is very sensitive to mercury. This is placed in different parts of the room and will indicate the presence of extremely small amounts of mercury in the atmosphere. A strip of this paper is also maintained in steady contact with continuous flue gas samples to indicate any leakage in any part of the system.

We expect to have the installation in operation within a few months and at that time many details of the installation will be available for publication. The economies will also be published when determined by operation.

Super-Excited Condensers

Three 30,000-kva. units at Plymouth Meeting substation of Philadelphia Electric Company regulate receiver-end voltage of 220-kv. line and also increase its power limit during short circuits

By O. A. GUSTAFSON
General Electric Company

IN LINE with the present increasing interest surrounding transmission and system stability, an interesting synchronous condenser installation has recently been undertaken, wherein the condensers are to be equipped with a special excitation scheme designed to permit their maximum utilization in raising the transmission system power limit during short-circuit disturbances.

Three 30,000-kva. synchronous condensers are to be installed for the Philadelphia Electric Company at its Plymouth Meeting substation, the receiver end of the 220-kv. transmission line from the new Conowingo hydro development.

The requirements for normal voltage regulation by power-factor control will call upon these condensers to operate at only one-third load, but the excitation system is designed to increase this output to approximately twice normal in one-half second whenever system disturbances demand a sudden and large increase in leading kva.

To obtain the results, an excitation system of unusual effectiveness is required, so much so that, as a matter of distinction, the term "super-excitation" has been used in designating such class of excitation.

The following discussion will cover in some detail the component parts of the equipment with their design limits and operating characteristics, along with a short description of a pertinent test, conducted to indicate in miniature what is expected of the total equipment of the 30,000-kva. condensers.

EQUIPMENT USED ON CONDENSERS

The synchronous condensers are rated 30,000 kva., 600 r.p.m., 13,800 volts, and are horizontal units of standard design. The excitation equipment connected to each consists primarily of:

(a) *A main exciter,* direct-connected to one end of the condenser shaft, eight poles, compound wound, with a nominal rating of 165 kw. at 250 volts.

(b) *A sub-exciter,* direct-connected to the other end of the condenser shaft, six poles, compound wound, with a continuous rating of 40 kw. at 250 volts.

(c) *An alternating-current voltage* regulator for the main exciter.

The maximum momentary output of the synchronous condensers was fixed at 55,000 kva. as, due to saturation present in a normal machine, additional output above this value could be obtained only by an impractical and uneconomical amount of field current. Therefore, the maximum load current of the main exciter will be determined by the condenser field current corresponding to 55,000 kva. The maximum working range or "ceiling" voltage was chosen to be approximately 1,000 as a reasonable compromise between the desirability of putting the increased excitation on the condenser as quickly as possible and the proper appreciation of what momentary maximum voltages should be applied to standard 250-volt synchronous-condenser field insulation. It will be seen from the calculated saturation curve (Fig. 1) of

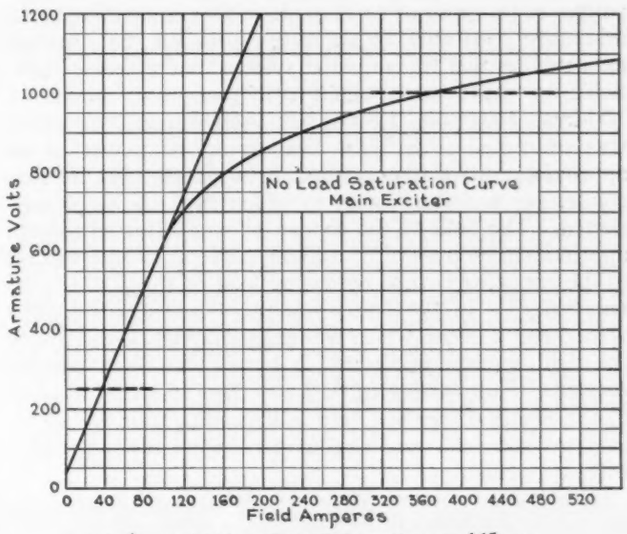


FIG. 1—NO-LOAD SATURATION CURVE FOR 165-KW., 250-VOLT EXCITER

the main exciter, however, that this "ceiling" of approximately 1,000 volts is not the saturation limit of the machine. This maximum allowable voltage is established by means of a resistance in the main exciter field, which, in conjunction with the working voltage on the sub-exciter, will just give the required "ceiling" voltage. This resistance, therefore, also fixes the maximum current demand on the sub-exciter.

Thus, the main exciter will be called upon to commutate momentarily the field current required by the condenser for an output of 55,000 kva., and this current must be commutated at the "ceiling" voltage of approximately 1,000 volts. The voltage of the sub-exciter is held at approximately 250 volts, thus assuring a constant source of voltage for producing the excitation in the field of the main exciter.

If the transmission system suffers a disturbance, causing a major drop in voltage on the high-voltage side of the transformer to which the condenser is connected, the voltage regulator causes the exciter voltage to rise to its ceiling value, at a rate of 6,000 to 7,000 volts per second. This rate of rise, though extraordinary, is in line with

the other general design characteristics of super-excitation. This ceiling value of nearly four times normal voltage immediately forces the condenser field current and armature current above the short-circuit values at a very rapid rate. If system conditions demand it, the regulator will permit the condenser field current to rise to its maximum allowable value, which will result in an output of 55,000 kva., assuming normal voltage.

Momentary Output Adjusted by Excitation

It should be appreciated that this maximum momentary output may be decreased to any value desired by adjustment of excitation equipment, if system conditions indicate that a 55,000 kva. upper limit is not necessary.

When the major system disturbance subsides, the regulator causes the exciter voltage to drop to any value commensurate with the condenser load requirements following the disturbance. This completes the cycle; the condenser has given the system its assistance and is now ready to resume normal operation.

The advance outlined in the art of providing fast excitation is the result of much extensive calculation and experimentation on the part of the General Electric Company. A program of tests made in this connection, with miniature apparatus, so accurately parallels the situation expected on this transmission system that it seems justifiable to make some detail reference to it here. A 100-kva., four-pole, 1,800-r.p.m. synchronous condenser was connected to a 5,000 kva. source of power as an approximation of the relation between the 30,000 kva. condensers and the system to which they are to be connected. The field of the condenser was adjusted to give approximately one-third leading current to correspond to the expected normal operating load of the 30,000-kva. condensers. In the test room there was available 550 volts direct current, which was approximately seven times the field voltage necessary to obtain one-third leading current. This voltage of 550 was then suddenly applied to the small condenser field and oscillograms of stator amperes and volts, and field amperes were taken to show what happened.

The rate of rise of stator amperes, as evidenced by the swing of the ammeter needle, was impressive. In spite of the natural lag in the instrument, its needle traveled the meter scale with remarkable speed.

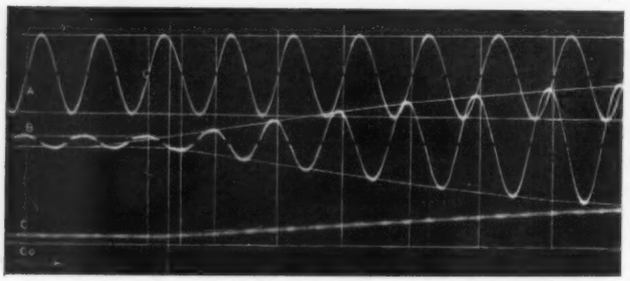


FIG. 2—OSCILLOGRAM OF TEST ON 100-KVA. SYNCHRONOUS CONDENSER WHICH IS INDICATIVE OF RESULTS EXPECTED ON THE 30,000-KVA. MACHINES

A—60-cycle terminal voltage
B—Stator current
C—Field current
C_0—Zero line of field current

Fig. 2 shows the resulting oscillogram. The point where the 550 volts was applied is clearly evident in the oscillograms of the field current. Fig. 3 shows curves plotted from data taken from Fig. 2, which are self-explanatory and indicate clearly the very high speeds obtained. Calculations made on the test machine check very closely with the results of the test. It is evident that the rate of increase of kilovolt-ampere obtained in the above machine is much higher than expected in the very much larger 30,000-kva. condensers under discussion, but after correcting for the difference in design constants which affect the calculations, the results expected from the 30,000-kva. synchronous condensers are entirely in line with the test results obtained on the small machine.

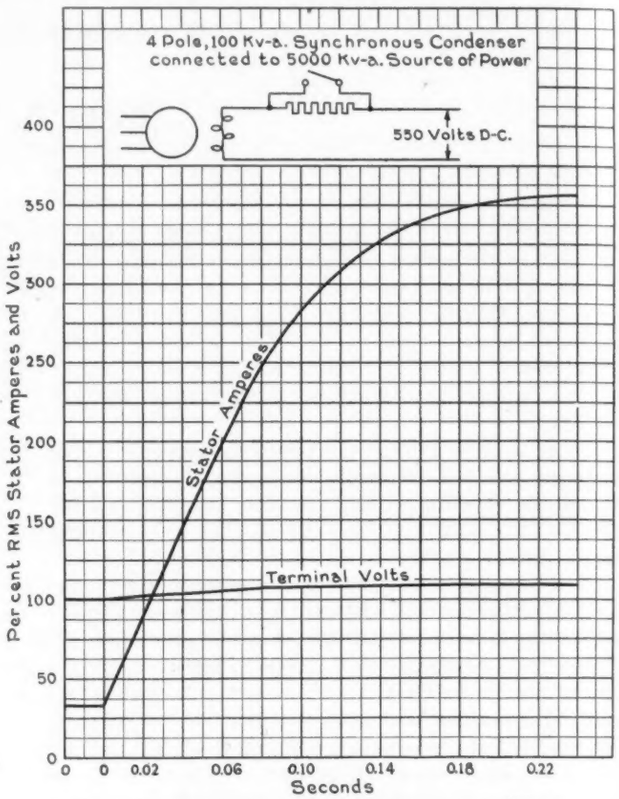


FIG. 3—PLOT OF CONDITIONS OBTAINED IN TEST OF 100-KVA. SYNCHRONOUS CONDENSER, CALCULATED FROM THE OSCILLOGRAM SHOWN IN FIG. 2

A word of caution might well be injected into the discussion as the evident remarkable increase in kilovolt-ampere might indicate the desirability of always providing super-excitation on synchronous condensers. It must be remembered that fast excitation is only one of many ways of increasing stability and is by no means to be considered a cure-all. Unless applied with judgment and full knowledge of all factors involved, it may have harmful potentialities, which increase with the degree of excitation speed considered.

55 Per Cent of Belgian Homes Served Electrically

ACCORDING to the result of a recent survey reported by the Belgian Union for Electrical Development it appears that about 55 per cent of the homes in Belgium have an electrical service connection. This is a material increase over the percentage reported in *Commerce Reports* of Dec. 6, 1926, and subsequently quoted in the Electrical World. The date to which the earlier figure applies is not reported; the difference presumably represents several years' growth.

Beauty and Utility in Hydro Plants

By harmonizing generating stations with adjacent summer resort property objections thereto were avoided

By H. W. Gochnauer
General Manager Northern Electric Company of Wisconsin, Green Bay, Wis.

THE Northern Electric Company of Wisconsin has completed a hydro-electric plant on the Menominee River at Chalk Hill, Wis., which is somewhat individualistic in appearance, although its layout does not deviate in general from the stock power house.

Two beautiful lakes will be formed by the developments. The shores are mostly high and rugged, fronted by deep water with many interesting bays, fingers and islands. Pines, firs, birches, aspens and oaks produce wonderful changing color effects throughout the summer, bringing the season to a kaleidoscopic climax in the fall with a riotous brush.

The Northern Electric Company, realizing the high value of this lake-shore property, expects this year to place estates for summer homes on the market. In keeping with this project, careful thought was given to the external and internal design of the power houses. An endeavor was made to make them jewels in the wooded landscape, rather than commercial buildings.

The Chalk Hill plant is built of tapestry face brick of dark red and brown shades with a dark raked joint. A precast light yellow-brown trim stone is used for belt courses and copings, which, with the massive columns, give the structure a solid appearance in harmony with the solidity of the concrete substructure. The high, triple Gothic arch windows are glazed with lead-stained glass. The borders and tops of each window panel are composed of rather deep blues, greens and ambers in squares, triangles and rectangles, and the center section is of amber glass, graded upward from a very light to a rather dark shade.

The interior walls are built of salt-glazed brick of a light straw color. The tile floor is of darker shades, containing rich browns, reds and blues. Borders of square tile are laid around the outer walls and around the generators. The generators, governors and ornamental wrought-iron railings are painted a light blue, harmonizing with the blue in the windows. The machinery and rails are trimmed with a light yellow, conforming in shade with the brick side walls. Cathedral lights of cast bronze, supported on wrought-iron brackets, adorn the side walls.

Nearing completion at the White Rapids plant is a similar plant which will, however, surpass in beauty the one at Chalk Hill. The favorable comments on the project received from visitors are most gratifying, and the most pleasing fact is that only a slight additional expenditure was made to produce the general effects desired.

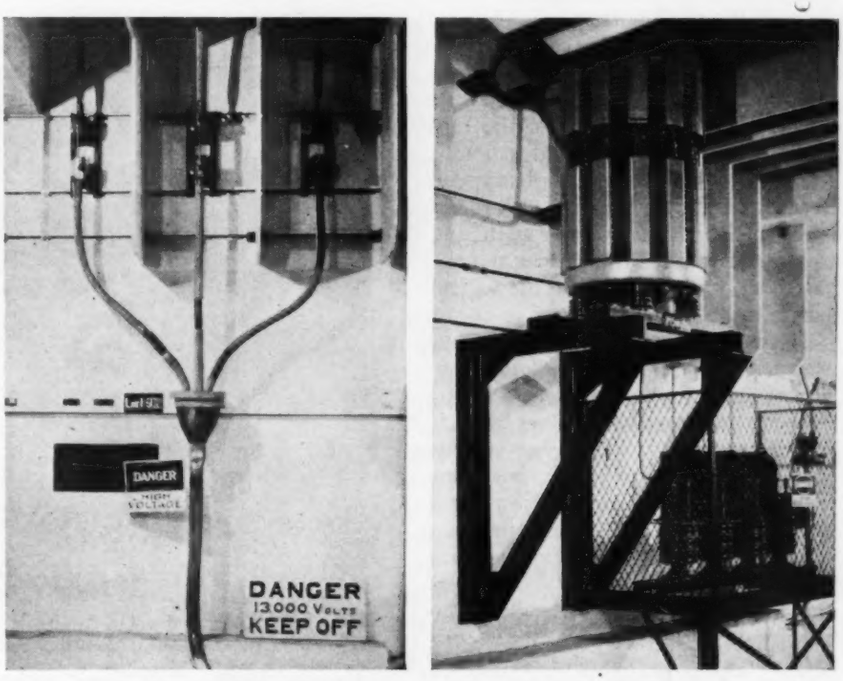
The installation at Chalk Hill comprises a dam of eleven 12x24-ft. Tainter gates and a power house containing three vertical units. Both generators and turbines were furnished by the Allis-Chalmers Manufacturing Company and the switchboard and transformers by the General Electric Company. Nagler adjustable-blade runners, permitting flexibility of operation with various quantities of water, are connected to 3,250-kva. generators. The total capacity of the plant is about 11,500 hp., with a 28-ft. head.

The White Rapids plant will be very similar, excepting that a 29-ft. head is available and the dam consists of nine Tainter gates, 14x24 ft. The wheels at White Rapids are Francis type vertical turbines furnished by the S. Morgan Smith Company, and the generators are furnished by the General Electric Company. In this installation, two 3,750-kva. and one 2,500-kva. generators at 100 and 120 r.p.m. are being installed. The two sizes are being used to provide flexibility for various quantities of water. Due to the facts that the heads are practically the same and that each plant will receive the same amount of water, it will be interesting to compare the amount of power produced by the two types of water turbines.

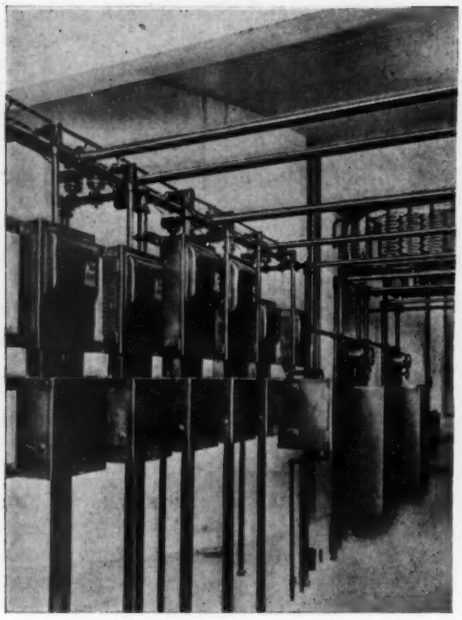
Views of one station were published on page 1028 of the Nov. 19, 1927, issue of Electrical World.

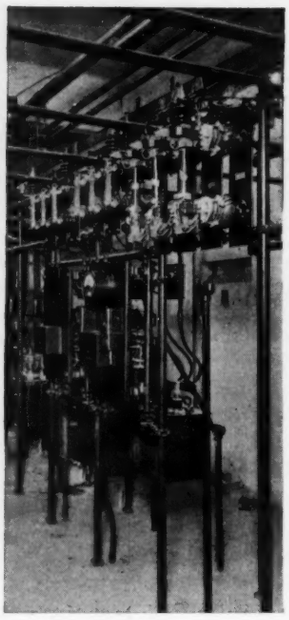
Flexibility of Arrangement and Operating Safety

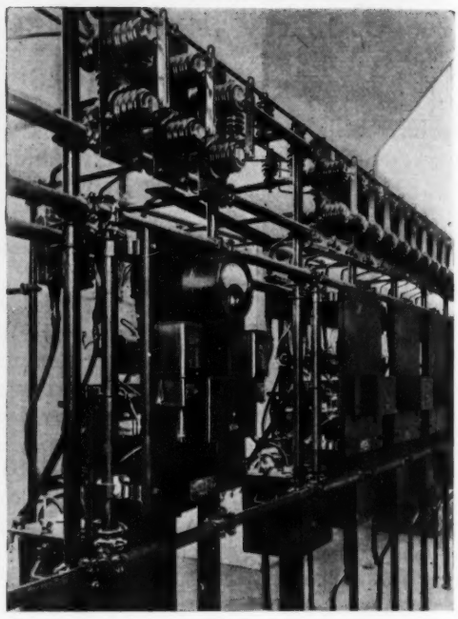
OPERATING safety is afforded in the No. 6 substation of the United Electric Light Company, Springfield, Mass., by mounting reactors on steel brackets and installing cable-disconnecting switches out of ordinary reach from the floor. Apparatus near the level of operators' bodies is screened against chance contacts. By the use of channeled slots in the concrete wall the spacing and arrangement of switch bases and barriers may be varied to meet local conditions and service requirements.



CABLE DISCONNECTS AT SAFE DISTANCE FROM FLOOR; REACTOR ELEVATED ON BRACKETS, AND APPARATUS BELOW IS SCREENED







Magnetic across-the-line starters with push-button control

Left—Iron-clad service switches are connected with the magnetic starters by adapters for 900-hp. supersynchronous motors.

Center—These solenoid-operated feeder breakers automatically protect the magnetic across-the-line starters on short circuits.

Right—Magnetic across-the-line starters for 2,300-volt high-torque motors ranging from 20 to 100 hp.

Push-Button Across-Line Starters in Cement Mill

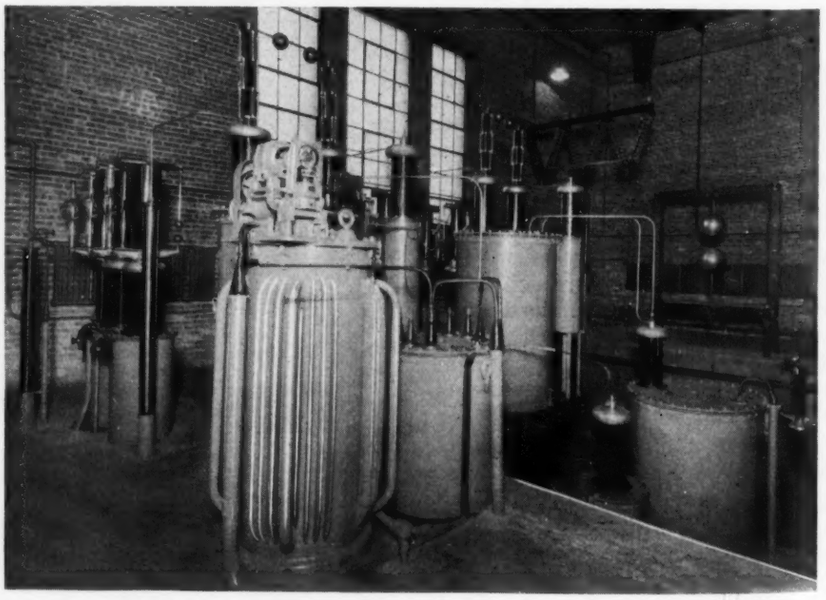
By I. T. Hockaday
General Electric Company, Houston, Tex.

With the exception of the motors in the machine shop, all the motors in the new plant of the Trinity Portland Cement Company, Houston, Tex., are controlled by across-the-line starters. The motors which are involved range from two 900-hp., super-synchronous down to ½-hp. sizes. The super-synchronous motors have automatic across-the-line push-button control, the push button being located near the motor and the control apparatus in the basement. The induction motors, ranging in size from 100 hp. down, are controlled by push buttons located near the motors and magnetic starting switches in the basement. Because of limited space, it was found necessary to place the switching equipment in a separate room and the basement was found to be the logical location.

Since the magnetic starting switches used have a comparatively low interrupting capacity and are controlled by temperature overload relays, short-circuit protection was given serious consideration. The motor bus runs from the switchboard to the bus on a pipe framework in the basement on which the starting switches are mounted, and from the latter bus several motors are fed. There being no oil circuit breakers between the bus and the starting switch, relays are used for short-circuit protection. The contact points on these relays are connected in series with the low-voltage device of the oil circuit breaker on the main switchboard. Thus, in case of short circuit, the relay involved will open the oil circuit breaker on the feeder involved. All relays have a hand-resetting device.

To feed the kiln, adjustable-speed, alternating-current motors with shunt characteristics are used, the motors being located at the feed end of the kiln far from the kiln operator. Push-button stations are situated so the chemist can control the feed of the kiln. The rate of feed into the kiln is determined from tachometers connected with each motor.

High-Tension Test Set for 132-Kv. Cable



To test 12-mile, 132,000-volt underground cable between the Hell Gate generating station and the Dunwoodie substation the New York Edison-United Companies utilize the 400,000-volt kenotron testing outfit shown.

Sinking-Fund Accumulation

Effects of long-lived items. Errors in average lives caused by compound interest affect rates of interest. Lives must be estimated within careful limits

By W. G. Cross

Assistant Valuation Engineer Southern California Edison Company, Los Angeles, Calif.

MANY depreciation reserves are set up on the life-table basis under the sinking-fund method. The theory of this procedure is that the cost of a major article of plant belonging to a utility and wearing out in the service of the public should be reimbursed at the end of the life of the article. Under the conditions where the sinking-fund method is considered applicable, there is set aside an annuity each year, which is assumed to draw interest while remaining in the reserve. At the end of the term of years originally estimated as comprising the life of the article these annuities, through the effect of compound interest at a certain specified rate, will produce in the depreciation reserve the amount of money necessary to so reimburse the utility. Theoretically, the life used for each article is the estimate of the actual term of years during which the article will function properly and, if there were no functional depreciation, would be the life sustained until wearing-out processes, such as decay, attrition, depletion, etc., had stopped its further usefulness. Entering of functional depreciation shortens the expectant life and the lives used, therefore, are usually somewhat shorter than the natural life would be.

Compound Interest Affects Accumulations

The case of articles which may be expected to have a long natural life, but which are subject to the exigencies of functional depreciation, has always presented a somewhat puzzling problem which is magnified under the sinking-fund method. The case of concrete or masonry diversion dams forming a portion of a hydro-electric project has been referred to already in previous articles. It is probable that the natural wearing life of many dams of this type will be very long. Records show the existence of certain bridges and highways constructed at the time of the Roman Empire, and it is most certainly true that some dams can be pointed to where the life has already been in excess of 100 years. Many dams now in existence have lived for a considerable period of time without showing any appreciable wear, and it is well within reason to assume that the concrete or masonry of which they are composed may continue to exist in place for a century or more. This does not, however, justify an infinite life for dams, nor can it be proved that possible functional depreciation shortens the life to 100 years, 50 years, 40 years or any exact term of years. It must be conceded that the life cannot be accurately predicted.

Still bearing in mind that depreciation annuities are being discussed on the life-table basis and that the sinking-fund method for future retirement is being considered, the author believes that such a method sets 40 to 50 years as the maximum life that logically can be assigned to any item of plant whatsoever and still stay within the limits of practicability. Compound interest produces an increase from an original sum of $1 to $10.29 in 40 years and to $339.30 in 100 years, at a 6 per cent rate. An amount of $1 set aside annually will produce $154.76 in 40 years and $5,638.37 in 100 years at 6 per cent. On the other side of the slate, if we desire to accumulate $1,000 at the end of two years, assuming 6 per cent interest, there will have to be set aside $485.44 annually. If the time period be taken as five years, the annuity will be $177.40; if 40 years, $6.46, and if 100 years, $0.18. The geometrical relationship of these figures should always be borne in mind. Referring to the annuity accumulation figures, we note that an annuity laid aside for a definite time, such as mentioned above, will grow to 37 times as much in 100 years as it will in 40 years. When setting the probable life of the dam, it is just as logical to estimate a 100-year life as a 50-year life, or vice versa, owing to the known uncertainty of what the future will bring. It may perhaps be difficult to define the point of departure and say that life predictions become vague after 40 years or after 50 years or, possibly, after twenty years, but the author herein attempts to show that beyond a certain point compound interest renders such predictions absurd.

Predictions May Involve Large Error

In the case mentioned, if 40 years be estimated and if the item lives 100 years, an accumulation will theoretically have been made 37 times too great; if the life is estimated at 100 years and the article lives 40, the accumulation will be only one-thirty-seventh of what it should have been. In the former case, the utility will have been protected and can stop the accumulation when the full amount has been collected, but in the latter case there is practically no recourse available.

Looking at the annuity side of the picture, it is found that for a $1,000 dam the annuity would be only $0.18 under the assumption of a 100-year life. This is a little more than two one-hundredths of 1 per cent of the cost of the dam. Very practical difficulties exist with respect to the theoretical accumulation of compound interest on $0.18 annuities, and here is a case where theory has to give way to practical fact. Such an annuity is too low for this item when considered from the practical standpoint. The $0.18 annuity theoretically accumulates some $28 in 40 years instead of the $1,000, and no one can integrate the uncertainty of functional depreciation and say that the dam may not be superseded in 40 years. It

would be better in this case, as far as the stability of the enterprise and its consequent serviceability to the public is concerned, to set aside $6.46 annually, rather than $0.18, on the $1,000 article, considering the balance of $6.28 annually as applicable to the stability of the utility. This insurance charge is less than two-thirds of 1 per cent on the investment and offsets the possibility of loss of thirty-six-thirty-sevenths of the investment, which is the amount of the risk involved under the conditions outlined.

From the practical point of view, therefore, it becomes evident that the uncertainty of life after 40 years leads to absurd results in accumulation, with possible disaster to a utility if the reserve is insufficient, while, on the other hand, the additional cost of the annuity to insure against such possible disastrous results is so small that it is well within the realms of ordinary business prudence to base all calculations on the lowered lives. The author believes that 40 years is the maximum life that should be assigned to any depreciable item of plant when considering sinking-fund annuities which are computed at an interest rate which is equal to or in excess of 4 per cent.

Assigning Average Lives

A most interesting phase of annuity calculations on the sinking-fund basis relates to the average life assigned to groups of items. It is quite customary to assign lives to groups covered by primary capital accounts under which the utility operates. The accounts in question may be those of the Federal Power Commission, the classification of the board of utility commissioners or that required by state regulatory bodies, etc. The items in certain accounts appear to be described by their nomenclature. The account Dams and Reservoirs naturally calls to mind imperishable structures such as masses of concrete and masonry, together with large excavations in the ground. The account Poles and Fixtures leaves in the mind the idea of wood poles standing in the ground, while the account Conductors immediately brings up the picture of copper wire remaining in the air through many years. This natural tendency to judge the contents of an accounting segregation by the name of the account is responsible for a great deal of error in the accumulation of the annuities which we have described above.

In the first place, the account Dams and Reservoirs includes not only a large amount of money relating to concrete and masonry structures, as well as large excavations designed to store water, but also includes a certain smaller amount of money in gates, water-measuring devices, spillway apparatus, booms, screens and innumerable other items pertaining to different types of installations. Poles and Fixtures account includes not only poles but also guy wire, anchors, machine bolts, etc. Conductors account includes not only copper wire but also insulators, insulator hardware, iron wire and conductor clamps. In almost every case the smaller items are of lesser life than the main items for which the accounts are named. It is common practice to assume that the amount of money comprising the lesser items is so small that it cannot materially affect the reserve accumulation. This is a most erroneous assumption.

Taking, for example, the dam discussed previously, and assuming, for the sake of argument, an estimated life of 100 years, an annuity of $0.18 would theoretically be sufficient to produce the required amount at the right time. Let us assume, however, that the dam is a complex structure and consists of two portions which may be separately considered in replacements. One, the major portion, consists of the concrete mass in the structure, with an assumed life of 100 years; the other consists of steel gates, guides and bolts, with a life of five years, amounting to much less in cost than the concrete alluded to. An $0.18 annuity will take care of $1,000 worth of concrete having a 100-year life, but this same annuity laid aside to cover steel gates and bolts which are replaced at the end of five years will cover only $1 of original cost. In a case such as this an amount of short life equipment of the nature of one-tenth of 1 per cent of the remaining long life equipment will modify the annuity materially.

The above example is somewhat extreme, but it is very logical to have situations which may be typified by an account covering both steel penstocks with a 40-year life and recording devices with a ten-year life. Mathematical calculation will show that 8 per cent of ten-year life equipment will require the same annuity as 100 per cent of 40-year life equipment. In a property comprising 8 per cent of ten-year life equipment and the remaining 92 per cent of 40-year life, the annuity, if calculated on the 40-year life, would be slightly over 50 per cent of what it should correctly be. Very careful consideration should be given to this fact when setting up sinking-fund annuities, for the above calculations make clear that a minor amount of short life equipment can so seriously distort the reserve accumulation structure that the utility may easily find itself without proper reserves at a period some time in the future, if life tables be based upon the mental impression received from the name of the account.

Determination of the Interest Rate

The question of interest rate to be used in connection with sinking-fund accumulations may or may not be open to decision by the utility. In some cases the interest rate is definitely fixed by the regulating commission and the latter may even go so far as to insist that strict accounting for the reserve be made and reported in the same manner as other phases of company activity covered under governmental regulation. There is a general theory involved here, however, based upon the economic law that capital will flow only to such points as will assure a return commensurate with the interest earned by similar risks in other situations. If a utility sets aside depreciation annuities, it is logical to assume that this money should be invested in some interest-bearing security which will be of a degree of risk similar to that of the business of the utility itself. The risk of the utility is measured by the risk of the bonds, for the bonds, in the last analysis, are only as secure as the going property. The reserve may be invested in the property itself, and this is commonly done. It follows naturally, therefore, that depreciation reserve accumulations invested in plant may logically carry an interest rate similar to that of bond money for utilities, for the utility usually has the option of either borrowing outside money or using its own reserve.

The argument is sometimes advanced that preservation of the integrity of the reserve is of utmost importance and that a degree of safety commensurate with deposit in the savings bank should require the utility to allow only 4 or 5 per cent interest on the amounts under accumulation. If, in such a case, the utility invests the

reserve in its own business, it must, by the same token, assume the risk of preserving the integrity of the money with an implied guarantee backed by surplus. While this argument has often been advanced, the procedure is not in common use and sinking-fund accumulations are more often at an interest rate commensurate with the cost of borrowed time money. Six per cent is a common interest rate for sinking-fund accumulations. With the present tendency toward lowering of money rates and the possibility that economic conditions in the United States may cause a permanent lowering of the interest level, it is somewhat problematical what the future will bring in this respect.

Approaches Straight-Line Method

In general, the lower the interest rate, the more nearly the calculation approaches the conditions inherent in the straight-line method of accumulation discussed in previous articles, and it is true that the special conditions attaching to compound interest rates as described in this article are effective in a constantly increasing ratio as the interest rate increases.

The use of the sinking-fund method of accumulation, therefore, introduces the danger that theoretical assignment of extremely long lives to items of plant may produce detrimental results in the actual practice of the utility, and common business prudence demands that estimated lives must be kept within careful limits, for the most beautiful theory might be completely wrecked by the actuality of some advance in the public utility art. To preserve the stability of utility properties requires not only the theory of the mathematician but also the practical judgment of the business man and the exercise of good judgment in laying aside reserves to cover property being used in the service of the public. Common sense and business acumen are vital factors, not only from the utility point of view but from the point of view of future successful and adequate service to the public.

Commercial Lighting Campaign Increases Load 200 Kw.

By E. F. Champion
Illuminating Engineer Georgia Power Company

THE Georgia Power Company recently completed its third commercial lighting campaign, the results of which far exceeded the quota and expectations. A merchandising profit of more than $2,300 was realized. The total number of units sold was 1,615, which represents an increase in kilowatts of connected load of approximately 200, since the majority of the units replace 100, 150 and 200-watt equipment.

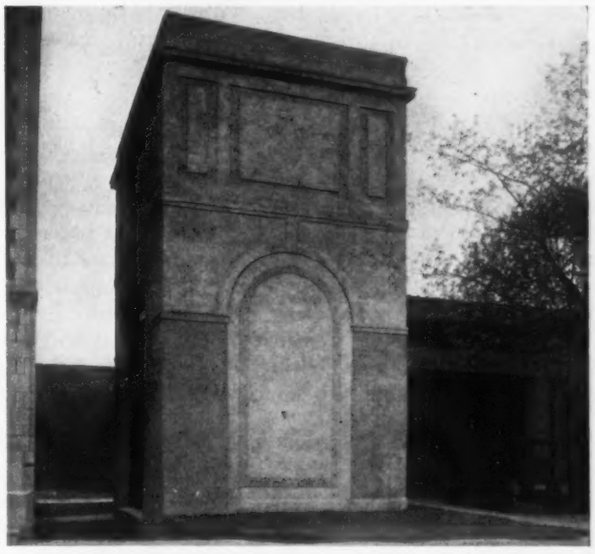
During this campaign it was decided to make a concerted effort on one type of fixture. The one chosen consisted of a 6-in. bronze suspension hanger with Mogul socket and 6x16-in. plain opal glassware. The unit was offered complete with 300-watt lamp, but if this size would overload the customer's present circuit, or cause an objectionable increase in his light bills, a 200-watt lamp was substituted for the same cost.

The selling price of the unit installed on present outlet, complete with lamp levolier switch, was $12. Where outlets or wiring required changes, an extra charge was made. Terms of $1 down and $1 per month were offered, with a discount of 5 per cent for cash within 30 days. The cost of the unit was $5; lamp, 80 cents; switch, 50 cents; hanging, $1.50; salesmen's commission, $1.75; advertising, $1; total, $10.55. This left a gross profit of $1.45 per unit.

The regular members of the sales department were used during this campaign. The territory served was divided into districts, each under the charge of a supervisor with entire control of sales and installation. The men worked in pairs and, since demonstration units were carried, while one salesman was connecting and preparing for the demonstration, the other salesman was selling the customer on the idea of better illumination. The salesmen alternated in carrying the unit and making demonstrations. Commissions were divided equally. Each salesman was given a territory or street each day, and was required to make a report on all the customers called on. These reports were carefully checked to be sure that the salesmen did not miss any of the prospects, and to furnish information to the illuminating engineers to follow out for the prospects on special application of lighting. The contracts for hanging the units were awarded to the three contractors submitting the lowest bids.

The principal prospects were the small stores and old office buildings. In many instances old glassware and lighting units were replaced by the newer type opal fixtures. In almost every case it was found necessary to sell the prospect on better illumination and what better illumination would do for him. After this, getting the signed orders for the fixtures was comparatively easy.

Substation Architecture Conforms With Adjacent Apartments



SUBSTATIONS erected by the Edison Electric Illuminating Company of Boston are being designed to harmonize with surrounding structures. One built recently in the Commonwealth Avenue apartment house terrritory is illustrated. A self-cooled, 12,000-kva., three-phase transformer with a 25-hp. motor-driven blower for cooling the transformer room is housed in the reinforced-concrete tower. A 3,500-gal. receptacle permits the transformer to be drained of oil if necessary. Energy is received from the Edgar generating station at 25 kv. and delivery is at 13 kv. An important connection with the system of the Cambridge Electric Light Company is also made at this point.

Fractional-Horsepower Motors Standardized

Final report of committee. Two lines of motors based on hours of use. Efficiency, power factor and apparent efficiency values fixed

BY A PROCESS of open discussions between all interested groups and through the workings of a cordial spirit of co-operation the joint committee on fractional-horsepower motors has obtained agreements which are expected to bring about very desirable results. In a series of meetings held during the past twelve months the committee has brought about a greatly improved situation in the industry. This committee was composed of representatives of the National Electric Light Association, the National Electrical Manufacturers' Association, the American Washing Machine Manufacturers' Association, the Association of Edison Illuminating Companies and, in addition, unorganized appliance manufacturers were represented by individuals. The committee was initiated by Prof. C. F. Hirshfeld of the Detroit Edison Company and worked with L. W. W. Morrow of the ELECTRICAL WORLD as chairman.

The work of the committee dealt with improving fractional-horsepower motors through agreements as to minimum specifications for efficiency, power factor, starting current and apparent efficiency. The economic cost to the industry as a whole has been weighed and each group has contributed a share of the burden. The committee feels that its work will react to the benefit of the industry and will stabilize the fractional-horsepower motor situation for some years. It asks for the hearty co-operation of all groups in the industry so that its recommendations may be put into operation.

SUMMARY OF ACTION

After careful consideration the committee decided that there should be two general classes of fractional-horsepower motors, as follows: (1) Long-hour use motors. (2) Short-hour use motors. Long-hour use motors are those which operate a large number of hours per month in the aggregate and consume sufficient energy to make efficiency of economic importance. Specific applications for these motors agreed upon by the committee are electric refrigerators and electric oil burners. Short-hour use motors are those which are in operation a relatively small number of hours per month so that their consumption of energy is small. Typical applications of these motors are washing machines, dish washers and home food choppers.

Minimum specifications for long-hour use motors and for short-hour use motors operating on 110-volt, 60-cycle circuits at 1,800 r.p.m. as agreed on are given in the accompanying tables. The short-hour and long-hour use motors have the same current specifications and approximately the same power-factor specifications. The major difference is in efficiency values. These efficiency differences are expected to be reflected in motor prices.

MINIMUM SPECIFICATIONS FOR LONG-HOUR USE MOTORS OPERATING ON 110-VOLT, 60-CYCLE CIRCUITS AT 1,800 R.P.M.

Rating in hp.	1/8	1/6	1/4	1/3	1/2	3/4
Power factor in per cent.	52	56	60	61	63	65
Efficiency in per cent.	53	58	62	63	65	67
Apparent efficiency in per cent.	30	36	42	44	47	49
Locked rotor amps.	20	20	20	20	26.6	40
Locked rotor amps. at 75 per cent load.	15	15	15	15	20	30

MINIMUM SPECIFICATIONS FOR SHORT-HOUR USE MOTORS OPERATING ON 110-VOLT, 60-CYCLE CIRCUITS AT 1,800 R.P.M.

Rating in hp.	1/8	1/6	1/4	1/3	1/2	3/4
Power factor in per cent.	50	52	56	58	60	62
Efficiency in per cent.	41	46	51	54	58	61
Apparent efficiency in per cent.	24	27	32	35	39	42
Locked rotor amps.	20	20	20	20	26.6	40
Locked rotor amps. at 75 per cent load	15	15	15	15	20	30

NOTE.—Where the product of the minimum values of power factor and efficiency, as shown in the table, do not equal the apparent efficiency it is understood that either the power factor or the efficiency values will be increased by the manufacturer to make the product of power factor and efficiency equal to the stated apparent efficiency.

EXCEPTION FOR WASHING MACHINE MOTOR

The values given apply to all 4-pole, 110-volt, 60-cycle fractional-horsepower motors with the exception of the washing-machine motor. It must conform to efficiency, power factor and apparent efficiency specifications, but not to locked rotor ampere values. After careful study the joint committee felt that time should be given for working out the washing machine problem and it agreed that the washing machine situation warranted, for the present, an exception in regard to the locked rotor ampere values for all other applications.

The 1/4-hp. long-hour use motor should meet these specifications as of Jan. 1, 1928. Motor manufacturers agreed to develop the other sizes and types to meet the specifications as soon as possible and an ultimate date of Jan. 1, 1929, was agreed upon as the time all new motors should conform to the new specifications. Motors characterized by these specifications represent a great improvement on existing motors and necessitate a complete redesign of the majority of fractional-horsepower motors now made. The time element was considered a minimum in view of the time required to redesign, retool and get production in factories.

These specifications apply to motors which are normally connected to lighting circuits and which may be expected to operate at times during lighting hours. The values given are minimum values obtained by test after the motor has operated a reasonable time (at least 24 hours) to limber it up. It was agreed upon as desirable that motors of the 1,800-r.p.m. 1/4-hp., 110-volt, 60-cycle size should be produced as soon as possible with a full-load efficiency of at least 70 per cent and a full-load power factor of 65 per cent, giving an apparent efficiency of at least 45.5 per cent. It was thought such motors for refrigerators and oil burners would be justified in price by capitalizing the cost of energy used as compared to a cheaper but less efficient motor.

The joint committee adopted the new specifications for use in this country. Motor manufacturers are committed to an expense of upward of $1,000,000 in redesign and retooling costs. The utilities promised to do their part toward securing the use of the proposed motors and to urge that all central-station companies adopt uniform rulings in agreement with the recommendations of the joint committee because the use of present motors seriously affects utility service. Appliance manufacturers promised to follow the specifications and principles agreed upon by the joint committee.

The report of the committee was submitted for approval to the associations represented on the committee and already has the approval of the majority of the individual appliance manufacturers. The joint committee believes prompt action should be taken by the parent organizations and that, if approved, this report be distributed to each member so that he may be guided by the committee findings.

Southern Pine and Creosoting

Characteristics of wood. Woods operations and treating processes. Applications and service experiences. Purchases and specifications

By L. W. W. Morrow
Managing Editor Electrical World

WHAT are the characteristics of creosoted Southern yellow pine? What are the service experiences of those using treated timber? What specifications are advisable for purchasing creosoted poles, ties and structural lumber?

The use of creosoted pine is growing rapidly, and with that use, the foregoing are some of the questions that arise in the minds of prospective purchasers and users unfamiliar with this treated wood.

It is important that these questions be answered, for the near future will see the timber markets supplied largely from the forests of the South and of the West. A significant fact in this connection is that the annual statistics compiled by the government show twice as many creosoted pine poles used in 1924 as in 1923. Creosoted Southern pine and timber from the forests in the far West are used in increasingly large quantities, for the chestnut, Northern cedar and other familiar woods of the East and Middle West have been used more rapidly than they are produced. The South has large forests of pine, and new trees grow so rapidly that exhaustion of the supply is impossible if ordinary precautions are taken. In from 20 to 25 years a pine tree can be grown that will give a pole 20 ft. long with a 6-in. top.

PEELED POLES IN A SOUTHERN WOOD

Three Kinds of Pine Used

The general term Southern yellow pine applies to three principal types of conifers. These are the "longleaf," the "shortleaf" and the "loblolly." Their strength characteristics as compared with that of other woods used for poles are indicated in the accompanying table. As among themselves there is a slight difference in the density, in the number of growth rings per unit cross-section, in the length and arrangement of needles and in the depth of sap wood, but their structural difference is so slight that, once away from the stump, they can be distinguished only with difficulty. All possess structures which admit of creosote oil preservative treatment to best advantage both as regards the depth of penetration and the quantity of creosote absorbed in the wood.

The untreated timber is subject to rapid decay under outdoor service conditions, and the creosote treatment is used to insure the quality and strength of the wood over a long period of time independently of weather exposure in service.

Through the courtesy of the International Creosoting & Construction Company the writer was privileged to visit and inspect its operations from woods to plant at Texarkana, Tex. The pine in this region is purchased from local producers within a 300-mile radius of Texarkana. Division organizations with a staff of inspectors care for the product until it arrives in the large yards in Texarkana. The pines are cut by hand labor, using crosscut saws. The branches are removed, then the top, and finally all the bark is peeled from the trunk, after which the pole in embryo is inspected for dimensions and condition and then is accepted or rejected. A frequent cause of rejection is the presence of a "punk knot." This is a defect in the tree which may show only as a small opening on the surface and yet the interior of the trunk may be rotted for several feet above and below the knot. Railroad ties are produced by local crews in a similar manner to the poles and are hewed to dimensions. In order to pass inspection they must meet the specifications of the American Railway Engineering Association. The inspectors work in pairs and must have had a previous training in woodsmanship and treating methods used at the plant and finally must serve a woods apprenticeship under an experienced inspector.

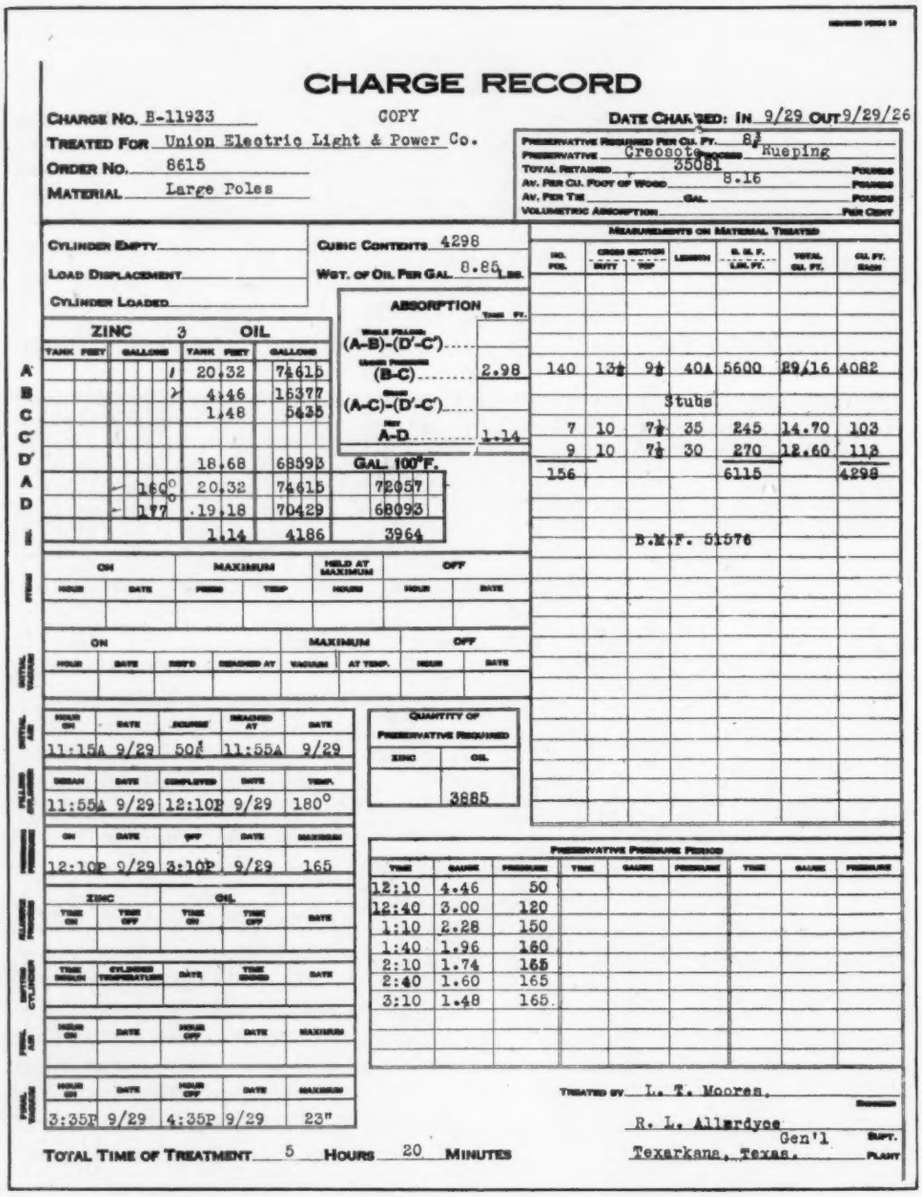
After the woods inspector has passed upon the timber and classified and marked it, the material is placed on cars and shipped to the plant at Texarkana. Upon

arrival in the yard the poles are unloaded by locomotive cranes. All the timber is inspected carefully at this time, and if it is to be treated immediately, it is framed and roofed and loaded on cylinder trams. If the timber is to be air seasoned, it is taken to the storage yard and placed in stacks, with creosoted separators inserted to give ample air space between pieces. The yard is well drained by tile sewer lines and no grass or other vegetation is permitted to grow. Evaporation of moisture from the stacks is further facilitated by the fact that the bottom of each stack is at least 2 ft. above the ground and rests on creosoted blocks.

The seasoning operation is very important; the timber in the yards is watched closely and borings for moisture are taken regularly. When the moisture content is about 30 per cent, the wood is ready for treatment. It is inspected carefully for the third time and either receives the full treatment specified by the purchaser or a 4-lb. per-cubic-foot treatment, which is sufficient to preserve the wood for the short time it will be retained in yard storage previous to the full treatment required on a purchase order.

A large treating plant was found in operation at Texarkana. Two large cylinders, four creosote tanks of 90,000 gal. each, a creosote storage tank with a capacity of 300,000 gal., a boiler plant of 700 hp. and accessory equipment for producing, transmitting and using steam, air and creosote comprise the essential equipment used in the treating process. One of the steel-treating cylinders has a diameter of 9 ft. 6 in., is 165 ft. long and is made of 1-in. steel plate. Steel doors are located at each end of this cylinder and a standard narrow-gage track is installed upon which the loaded cylinder trams may be operated. The cylinder has a capacity of from 80,000 to 85,000 ft. and is used to treat poles, ties and structural timber as desired. The second cylinder is 6 ft. in diameter, is 125 ft. long and has a capacity of about 20,000 ft. of timber. Poles with 10-in. tops and 110 ft. long have been treated in these retorts.

There are three processes for treating poles with creosote: the Rueping empty cell, the Lowry and the Bethel full cell. The International Creosoting & Construction Company is equipped to use all of these processes, but uses the Bethel full cell and the Rueping empty cell processes. For poles it is customary to use 8 lb. of creosote per cubic foot in the empty cell process and 12 lb. in the full cell process.



CHARGE RECORD

Charge No. B-11933 COPY Date Charged: In 9/29 Out 9/29/26

Treated For Union Electric Light & Power Co.

Order No. 8615

Material Large Poles

Preservative Required Per Cu. Ft. 8# Rueping

Preservative Creosote

Total Retained 35081 Pounds

Av. Per Cu. Foot of Wood 8.16 Pounds

Av. Per Tie Gal. Pounds

Volumetric Absorption Per Cent

Cylinder Empty

Load Displacement

Cylinder Loaded

Cubic Contents 4298

Wgt. of Oil Per Gal. 8.85 Lbs.

Absorption

	Tank Ft.
(A-B)-(D'-C')	
(B-C)	2.98
(A-C)-(D'-C')	
A-D	1.14

Gal. 100° F.

	Zinc Tank Feet	Zinc Gallons	Oil Tank Feet	Oil Gallons	Gal. 100° F.
A			20.32	74615	
B			4.46	16377	
C			1.48	5435	
C'					
D'			18.68	68593	
A	160°		20.32	74615	72057
D	177		19.18	70429	68093
			1.14	4186	3964

Measurements on Material Treated

No. Pcs.	Cross Section Butt	Cross Section Top	Length	B. M. F. Lin. Ft.	Total Cu. Ft.	Cu. Ft. Each
140	13½	9½	40A	5600	29.16	4082
		Stubs				
7	10	7½	35	245	14.70	103
9	10	7½	30	270	12.60	113
156				6115		4298
		B.M.F. 51576				

Fill: On — Hour, Date; Maximum — Press., Temp.; Held at Maximum — Hours; Off — Hour, Date

Initial Vacuum: On — Hour, Date, Reg'd, Obtained At; Maximum — Vacuum, At Temp.; Off — Hour, Date

Initial Air: Hour On	Date	Pressure	Reached At	Date
11:15A	9/29	50#	11:55A	9/29

Filling Cylinder: Began	Date	Completed	Date	Temp.
11:55A	9/29	12:10P	9/29	180°

Pressure: On	Date	Off	Date	Maximum
12:10P	9/29	3:10P	9/29	165

Quantity of Preservative Required

Zinc	Oil
	3885

Preservative Pressure Period

Time	Gauge	Pressure	Time	Gauge	Pressure	Time	Gauge	Pressure
12:10	4.46	50						
12:40	3.00	120						
1:10	2.28	150						
1:40	1.96	160						
2:10	1.74	165						
2:40	1.60	165						
3:10	1.48	165						

Zinc: Time On, Time Off — Oil: Time On, Time Off, Date

Emptying Cylinder: Time Begun, Cylinder Temperature, Date, Time Ended, Date

Final Air: Hour On, Date, Hour Off, Date, Maximum

Final Vacuum: Hour On	Date	Hour Off	Date	Maximum
3:35P	9/29	4:35P	9/29	23"

Total Time of Treatment 5 Hours 20 Minutes

Treated By L. T. Moores, Foreman

R. L. Allerdyce Gen'l Supt.

Texarkana, Texas. Plant

CHARGE RECORD USED WITH RUEPING PROCESS OF WOOD-POLE IMPREGNATION

Empty Cell Process

In the Rueping process, as the first step, air is pumped into the cylinder and thus into the wood under high pressure; then while the air pressure is maintained the cylinder is filled with creosote at a temperature of between 180 and 200 deg. F. As the oil enters, the air is gradually released but without allowing the pressure to drop. In this way the cylinder is filled with oil, but a considerable quantity of air is entrapped in the wood. More oil is then pumped in and the pressure increased until it finally reaches a maximum of 165 to 200 lb., the exact figure depending on the individual characteristics of the wood under treatment. After sufficient creosote has been injected this pressure is released, the oil is drained from the cylinder and a final vacuum is applied. This release in pressure allows the air entrapped in the wood to expand and force much of the oil out of the

SAWING A PINE TREE INTO LENGTHS FOR MAKING TIES

wood, leaving partly empty wood cells and the final retention of creosote specified by the customer.

In the Bethel process, after the material is placed in the cylinder, a vacuum of about 26 in. is maintained until the wood is as dry and free from air as practicable, and then, without first breaking the vacuum, the cylinder is completely filled with the creosote oil. The vacuum not only accelerates the entrance of the preservative into the retort but also makes it possible to force the preservative into the timber more quickly and with less pressure than is the case when the preservative must displace or compress the air in the wood. After the retort is filled, additional creosote is forced into the cylinder by means of pressure pumps, the pressure being gradually raised to and usually maintained at not less than 125 lb. per square inch at a temperature of 180 to 200 deg. F., until the required amount of the preservative has been forced into the wood. The pressure is then released, the oil drained from the cylinder and another vacuum drawn. The object of this final vacuum is to remove the surplus creosote from the surface of the timber and hasten the dripping so that the treated wood can be removed from the cylinder as soon as possible. The final vacuum also makes the wood drier on the surface and cleaner to handle.

In either treatment 100 per cent of the quantity of creosote specified by the customer's order is the minimum quantity retained by the wood.

The creosote used in the treatment conforms to A.R.E.A. specifications, and a laboratory with a staff of three graduate chemists is maintained to test the creosote, to supervise the treatments and to do development work. The usual tests on the creosote are based on fractional

MAKING A SQUARE-EDGED TIE

TABLE I—CHARACTERISTICS OF WOODS USED FOR POLES
Taken from U. S. Department of Agriculture Bulletin 556

Type of Wood	Breaking Strength, Lb. per Sq.In. Modulus of Rupture	Impact Strength Height of Drop (In.) Causing Complete Failure When Using 50-Lb. Hammer	Shearing Strength, Lb. per Sq.In.	Crushing Strength, Lb. per Sq.In.
Chestnut	5,600	24	800	2,470
Western red cedar	5,200	17	720	2,840
Northern white cedar	4,200	15	620	1,990
Southern longleaf	8,700	34	1,070	4,390
Southern shortleaf	8,000	39	890	3,810
Loblolly	7,500	32	900	3,580

distillation whereby a given quantity of creosote is heated and the fractions distilled at successive temperature increments are measured. The residue is then subjected to a standard test and the complete test results are balanced against the specifications. A skilled chemical control of the curing and treating process is considered essential to good products.

Sample Specifications

A large utility in the South which has used creosoted poles for many years presented the writer with a copy of the specifications now used for the purchase of these poles. This utility reports splendid service from the creosoted poles and purchases them in large quantities each year. The specifications are as follows:

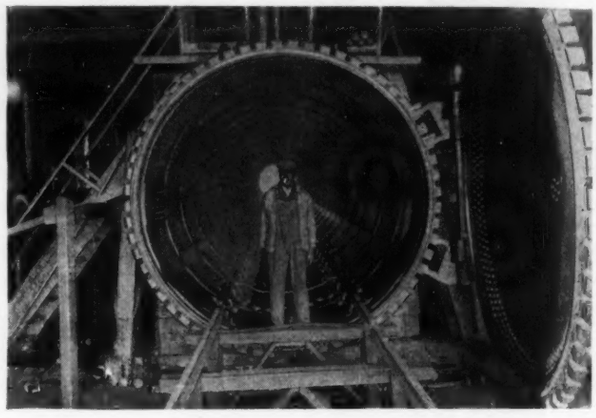
Quality of Poles.—All poles shall be cut from live, sound, dense Southern yellow pine, well proportioned from top to butt with a maximum sweep or curvature in one direction only of 1 in. for each 10 ft. of length measured at right angles to a line from the top of pole to a point 6 ft. from the butt. Poles must be free from large season checks, blisters or other irregular markings, and must be peeled free of inner bark. Knots must be trimmed close and the butt sawed along a plane which shall not be out of square with the axis of the pole by more than 2 in. per foot of butt diameter. A maximum of 3 ft. of boxed section of a tree may be included in a pole, measured from the butt, and this must not reduce the cross-section of the butt by more than 20 per cent.

Seasoning.—It is essential that all poles be air seasoned in the yard for a minimum of 30 days or as much longer as local experience will allow before sap wood decay of any nature will set in. In the air seasoning, care must be used in stacking the poles to permit of minimum contact between poles and to eliminate any contact from pole to ground. Where the time permitted for air seasoning is restricted, suitable modifications are required in the tank seasoning process. (See particulars for treatment).

Dimensions.—The top dimensions of the poles shall be not less than the dimensions specified on purchase order, with a minimum taper of 1 in. in 10 ft. of length.

Framing Poles.—Before poles are subjected to the creosoting process, they shall be roofed and gained as indicated by drawing number specified on purchase order. Each gain shall be not more than ½ in. deep unless otherwise specified. Where more than one gain is required, they must be parallel and all holes must be squared with the axis of the pole. When a pole has a sweep or curvature, the gains must be made on the concave side. These requirements must be fulfilled and all work performed in a neat and workmanlike manner.

Selection of Timber for the Charge.—In order to secure uniform oil admittance in each pole in a specific batch prepared for a charge in the closed tank consideration must be given in selecting the batch, seasoning, proportion of heart to sap wood, proportion of size of resinous to pitch wood rings, number of rings per inch, and local conditions, together with the experience of the practical operator of the tank or cylinder.



EMPTY RETORT WITH A TALL NEGRO IN THE OPENING

Creosote Treatment of Poles.—In lieu of a specific process for the various methods of creosoting timber, the procedure outlined by the American Wood Preserving Association covering the 10 lb. "open cell treatment" shall be used unless otherwise specified. Attention is called to the necessity of each bidder submitting a graphic chart of the method used in treating timber. Treatment must be given a minimum of 1½ in. penetration when sap wood is 1½ in. or less in thickness. Where greater than 1½ in. in thickness, complete penetration of sap wood is required.

Specifications for Creosote Oil.—The grade of oil used in the treatment of timber shall be of a quality similar to that specified by the American Railway Engineering Association as No. 1 oil.

Inspection of Material.—Adequate facilities must be provided by the manufacturer for the inspection of timber by an authorized representative of the purchaser, and the purchaser reserves the right to reject any or all timber not conforming to the above specification.

The waiving of inspection by the purchaser does not relieve the manufacturer of the responsibility of conforming to the specifications, and the purchaser reserves the right to reject any or all unsatisfactory uninspected timber at the point of delivery.

TABLE II—ANNUAL CHARGES OF CREOSOTED TIMBER*

Tie in Open Track

	Plain Tie	Creosoted Tie
Life, years	7	15
Cost of tie	$1.02	$1.15
Cost of installation	0.75	0.75
Total	$1.77	$1.90
Interest, 7 per cent	0.12	$0.13
Depreciation	0.25	0.13
Cost per year	$0.37	$0.26
Saving per tie per year	.....	0.11
Saving per mile per year	.....	$290.40

30-Foot Poles, Class A

	Chestnut Plain	Pine Creosoted
Life, years	5	22
Cost of pole	$9.00	$11.35
Cost of setting	10.00	10.00
Total	$19.00	$21.35
Interest, 7 per cent	$1.33	$1.49
Depreciation	3.80	0.97
Cost per year	$5.13	$2.46
Saving per pole per year	.....	$2.67
Saving per mile per year (105.6 poles)	.....	$281.95

1,000 Board-Feet of Bridge Timber

	Plain	Creosoted
Life, years	12	25
Cost, erected	$65.00	$75.00
Interest, 7 per cent	$4.55	$5.25
Depreciation	5.42	3.00
Cost per year	$9.97	$8.25
Saving per year per 1,000 b.ft.	.....	$1.72

* C. A. Smith, Georgia Railway & Power Company.

Approximately 100 commercial plants in the South are creosoting pine poles, and several utilities have installed a creosoting plant for their own work. It is the opinion of purchasers of creosoted timber that many of these plants can do much to produce a uniformly good product and one that does not require rigid inspection by the purchaser. In the present highly competitive market it is advisable that purchases should be made on the basis of detailed specifications and careful inspections by men who know timber and understand creosoting and from reputable creosoting companies. One large purchaser reports a rejection of about 2 per cent on poles bought from local creosoting companies and states that a uniform product is difficult to secure.

Who Pays the Cost of Price Cutting?

A frank discussion of the warfare now being waged between the purchasing agents and the sellers in this buyers' market

By Earl Whitehorne
Commercial Editor Electrical World

WITHIN the memory of this generation there has never been a time when business men were talking more about the ethics and the economics of price cutting. It is an engrossing subject of conversation in the electrical industry right now. It concerns the power companies because they are large buyers. It concerns the electrical manufacturers because they are selling to these large buyers. It concerns them in the same way that the same conditions are involving other large buyers and sellers in numerous other industries. But the fact that these conditions are general does not make them any less particularly a problem which the electrical industry must face in its own field and work out for itself.

Some Experiences in Price Cutting

THE purchasing agents of large buyers are being accused of profiteering. The complaining manufacturers are being charged with lack of price courage. What is it all about?

In this article Mr. Whitehorne arrays the major factors in the situation. There will follow a further discussion of "Some Experiences in Price Cutting," in which the methods that are at present demoralizing the market for electrical apparatus will be described. The editors will welcome a frank expression from our readers on this important and much-disputed issue.

In a Buyers' Market

We are, of course, in a buyers' market. There is excess capacity and overproduction in manufactured products and an intense competition for orders. But that is not all. We have had other periods when the buyer was in the saddle, riding the salesman whip and spur, just as we have had sellers' markets, when demand exceeded supply and the pressure was upon the purchaser; during the war, for instance. And whereas then the salesman was playing one buyer against another for a better price, the purchasing agent today is juggling one seller against another for a lower figure. It is not unnatural. The purchasing agent feels that it is now his time to be the wolf. It is his night to howl. But times have changed, and what was once considered a fair game of bartering has come to be a matter of the economics of an industry.

For there has been much progress in the thinking of American business. The pack peddler and the patent medicine man have gone their way with their wooden nutmegs and fake nostrums. The days of barter in the village store have given place to a one-price policy in retail trade. Modern business ethics have purged the manufacturing field of many practices that once were looked upon as quite legitimate, but now are recognized as unfair either to the customer or the competitor. And now a new advance in the evolutionary process has introduced another idea—the responsibility of business men to protect the economic health of the industry in which they are engaged.

In other words, the growth of American industry has brought with it an extremely complex inter-relationship among manufacturers and between buyers and sellers throughout the land. Specialized production has developed a tremendous volume of interindustry trade in materials, equipment and services. And also large concentrations of capital and industry have resulted in a degree of interdependence between the buyer and the seller in such an industry as ours as has never been known before. And the present discussion of the prevalence of price cutting by manufacturers and profiteering by large purchasers has to deal with these new conditions.

An Industry Concern

Obviously it is poor business to be a party to a transaction in which either side is going to lose money. That is just common sense. For it usually costs more to win a new customer than the profit on the first order he gives. It is the continuing business from the account that pays. And it costs money also for a large buyer to take on a new supplier and establish an understanding of special

needs and a dependable service. Usually it costs more than is gained by changing to another line just to seize a slight price advantage on the initial order—which is too often offered as a bait.

But there is more to it than that today. For so vast is the flow of goods and so greatly is the modern buyer sustained in his own business by his suppliers that a large industrial organization has come to be vitally concerned with the prosperity of the other organizations from which it draws. Put a manufacturer out of business by rendering it impossible for him to make money and you must look elsewhere for your next shipment of whatever it is you need. Let him live and he will continue to help you make more money. And that is precisely the philosophy that has dominated in those much-heralded cases where a large buyer has examined into a seller's costs and refused to accept cut prices that netted him a loss, knowing that either this seller must hereafter skimp on quality or service or ultimately go to the wall—unless the price level is restored.

In the electrical industry, where an expensive engineering type of equipment is involved, the buyer also relies upon the manufacturer for another vital resource. He looks to the manufacturer to advance the art, to conduct expensive research, to carry forward the progress of engineering development. And if the manufacturer is denied profits that are adequate to finance the cost of it, then this will gradually cease and the industry must sacrifice one of its most priceless assets, unless the buyer assumes the burden.

Samuel Insull stated it well for electrical men in a much-quoted address in Chicago not so long ago. He said:

> You men who are in the branches of the business other than the central station—you have problems of your own. But the interdependence of the industry makes your problems ours, as it makes our problems yours. Central-station development creates the market for you and keeps it expanding. Development on your side assists our efficiency and facilitates use of our product.
>
> If competition in the sale of turbo-generators or cables or transformers is so keen as to hamper research work and threaten the quality or the rate of development; if too narrow margins restrict the wholesaler's ability to carry adequate stocks, supply sales service and extend credit to the retailer; if the keenness of competition between contractors impairs the adequacy or quality of wiring; if construction is hampered or not properly remunerated on account of policies in other branches of the business—if any of these things happen, the central-station companies, which use those materials and services, finally suffer the most.
>
> And, finally, the paramount responsibility, imposed upon all of us by our common interests, is to see to it that no obstacles are placed in the way of general electrical development—a development that is not yet nearly completed, but has already done so much to make our country the envy of all the world.

How It Is Done

Coming down to cases—just what is the situation in the electrical industry? Two things are happening:

1. Purchasing agents of large buyers are rigorously applying the thumbscrews to the manufacturers' salesmen and beating down price levels by ingenious methods of induced competition.

2. Manufacturers in their eagerness for volume are weakly submitting to this pressure and cutting prices to get orders that net a loss and demoralize their market.

The first reaction is to just say, "Well, under the circumstances the purchasing agents are smart and the manufacturers are not. Why worry?" But when you look ahead and ask yourself what the consequences may well be within this highly interdependent community of business interests if this condition should continue very long, you realize that in the end the buyer would suffer with the seller, and the entire industry would be the loser by it all. Large-scale profiteering by purchasers, widespread price cutting by manufacturers in this day and age soon become a common problem.

What is to be done? It would seem that the burden of reform would rest upon the manufacturers, who possess the right to accept an order or decline it as they wish. But as every manufacturer knows, the demand for volume is a remorseless pressure upon the sales department that must feed orders into the hungry hopper of a modern factory. And since the Sherman law forbids competing manufacturers to organize for mutual protection against the snares and pitfalls of a buyers' market, each one must take his chances in the open strife, and the price that can be charged depends upon the level of the market for competing lines. Let one sales manager weaken in the face of a persistent price squeezer and let a second fall in line and no other bidder can hope to hold to his figure and secure the business.

Three Recommendations

1. *That bids on standard listed apparatus should be offered for examination by any bidder who is called back and asked for a reduction of his price.*

2. *That salesmen should demand this as evidence of good faith on the part of the buyer whenever asked to cut a price after bids are in.*

3. *That post-mortems on competitive bids should be made standard practice among all manufacturers so that losers may understand their lost business.*

Apparently there remains but one legal and practical defense to which the manufacturer may have recourse. That is the organizing of industry opinion, to correct uneconomic practices and improve the standard of executive policy among both the buyers and the sellers. In other words, he must broaden the vision of the purchasing agent and stiffen the spinal structure of the sales manager.

Too Much Secrecy

The seat of the present trouble, it would appear, lies in the old tradition of the secrecy of bids, for here is the keenest weapon that the buyer is employing at the moment. A group of manufacturers are invited to submit bids on equipment to be purchased. The bids are in. The salesmen call. The purchasing agent thereupon proceeds privately to play each man against the others, telling each that he is high, inciting each to telephone the factory, whipsawing them with fear and hope, until the last price cut has been exacted and the last unhappy concession wrested from the profit margin on the goods. Too often he who was the low man at the outset is the low man at the end, but minus profit. Too often, also, the order was all the time intended for him for some good consideration of the quality or service offered, in return for which he has been mulcted of his company's earning power on that sale. Because of the traditional

sanctity of bids, he has been unable to demand a showdown when the bids are in, a chance to see whose price is really high—"which bird is early." For there are lying purchasing agents as well as lying salesmen and the temptation to play tricks with truth is sometimes great in buying.

Clearly, therefore, there are three things to be done as an approach to remedy:

1. Secrecy should be eliminated on bids for standard listed apparatus. Bids are published on government orders. Bids for private purchasers should be open to examination by any manufacturer who is called back and asked for a revision of his price. At present it is not supposed to be morally right to show a bid to a competitor. Where the bid entails a large element of engineering or other variables this secrecy will undoubtedly continue. But on standard listed apparatus—and this covers the major volume of the sales of industry—the buyer should show the bids when asking any bidder to reduce his price.

2. The salesman should demand this frank showdown whenever called upon to cut a price after the bids are in. He should expect it as an evidence of good faith on the part of the buyer. Manufacturers should refuse to consider a concession without this evidence.

3. The holding of post-mortems on competitive bids should be made standard practice among all electrical manufacturers, so that losers may analyze all bids and understand their lost business. This is lawful and already is being done to some extent, the exchange of bids being made by the bidders. The National Electrical Manufacturers' Association is actively promoting this idea and serving as a clearing house for its members. The practice should be made universal.

Of course, this would not end all cutting of prices. It would simply bring the practice out into the open and improve its morals. It would just be two steps toward an eventual one-price system.

But the seller should not be made to fight for this reform unaided. Purchasing agents individually and as nationally organized should also become the exponents of this idea. It is another step to be taken in the debunking of business, the banishing of deceit and trickery from trade. In this era of economic intelligence the gentle art of profiteering by purchasers should be laid away in shrouds along with the wooden nutmeg and that once popular commercial slogan, *caveat emptor!*

For men do not buy for price alone. Price is important. But other factors are equally important because they themselves constitute the value, for which the price is paid. The chief concern of the buyer should be to see that he obtains a value proportionate with the price. The chief concern of the seller should be to see that he obtains a price commensurate with the value. And these two ideals are not antagonistic. They go together like the well-known words *e pluribus unum,* to use more Latin.

Who pays the cost of price cutting, then? Both the buyer and the seller pay it. And in the end the entire industry suffers.

Analyzes Employees' Attitude Toward Electric Range

A SURVEY was made recently by the Northwestern Electric Company, Portland, Ore., to determine to what extent its employees use electric ranges in their homes. Out of 514 employees, 70 per cent, or 362, replied to a questionnaire, and of this number 37.5 per cent of those maintaining a home were using electric ranges. This is more than double the range saturation of domestic customers served by the company.

Employee use of ranges tabulated by class of work showed that 53 per cent of the employees in the commercial department used electric ranges. Classes showing the lowest use of ranges were station operators and line department and accounting department employees.

CENTRAL-STATION EMPLOYEES' IDEAS ON THE ELECTRIC RANGE

If you do not use an electric range now would you like to have one?

Yes	135
No	39
Doubtful	2

What features do you like best about electric cooking?

Cleanliness	207	Uniformity	19
Automatic control	50	Good looks of range	13
Less operating cost	40	No odor	30
Convenience	55	Safety	14
Better cooking	29	No waste	7
Less heat radiation	14	Less work	16
Efficiency	31	Cool	19
Quicker	17	Dependability	8
More palatable food	12		

If you do not use an electric range, what is your objection?

Initial cost	43	Not married	20
Off company lines	12	Eat in restaurant	5
Not living at home	13	Have satisfactory range	2
None	75	Cost of operation	3
Use gas range	17	Not in permanent home	4
Use wood range	6	Range in use serves as heater	2
Rent, not wired	10		

Do you take every opportunity to tell your friends of the advantages of electric cooking?

Yes	272
No	2
Sometimes	5

Replies to several pertinent questions contained in the questionnaire are given in the accompanying table. This shows that cleanliness, automatic control, less operating cost and convenience were the features liked best, and that initial cost was the greatest objection of those who voiced any objection. The fact that 75 employees had no objection at all to the use of an electric range indicates that it should not be difficult to develop a much greater employee use of ranges than now exists.

Floodlighting Sells Homes, Says Realtor

STARTING with November, 1927, the McDonald Realty Company, Schenectady, utilized floodlighting as a silent salesman to attract attention to its houses after dark. Experimentation with illumination to determine its sales influence was recommended by L. N. Lamboy of the New York Power & Light Corporation. Thirteen houses on one street were so illuminated. Five

2,750 WATTS FLOODLIGHT HOUSES, ASSISTING SALES

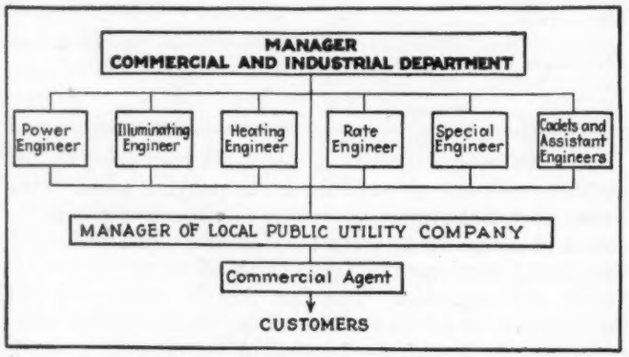
500-watt L-09 and one 250-watt L-11 General Electric floodlighting projectors were employed.

Commenting on the value of the floodlighting in creating sales, the realty company had the following to say:

"We are glad to say that many people were attracted, with the result that every evening large numbers of visitors turned out to inspect these homes, which resulted in furnishing a number of prospects and contributed to a great many of our sales. We are so pleased with this experiment that it is our intention to continue this form of advertising in our future building operations."

Commercial and Industrial Set-Up of a Management Company

FROM a single power sales engineer in 1920, the personnel of the commercial and industrial department of Charles H. Tenney & Company, Boston, Mass., has increased to an organization of from fifteen to 25 persons, depending on the amount and importance of the work in hand from time to time. The public utilities under this management serve a total of about 145,000 electric and 182,000 gas customers. The duties and staff set-up of this department were recently described by its manager, V. M. F. Tallman, in the pending rate case of the Malden Electric Company before the Massachusetts Department of Public Utilities, and through the courtesy of Palmer York, president of the Tenney organization, the accompanying chart summarizing its commercial and industrial activities is reproduced.



Activities of Department

COMMERCIAL & INDUSTRIAL BUSINESS (Elec., Gas, Steam), POWER, LIGHTING, STREET & TRAFFIC LIGHTING, HEATING

a. Survey and analysis of territory.
b. Solicitation of all business.
c. Following inquiries from present plants.
d. Following inquiries from prospective plants.
e. Follow up of all business—present and prospective.
f. Sales policies and sale of equipment.
g. Sales engineering — efficient use of service.
h. Customer's installations.
i. Change over, from one form or type to another.
j. Tests, trial installations, etc.
k. Rates and contracts; analysis, design, preparation and filing.
l. Relations with customers, contractors, engineers, architects and manufacturers.
m. Special investigations.
n. Research and development.
o. Publicity.
p. Customer's adjustments.
q. Following practices of other companies.
r. Training of local personnel.
s. Statistical and graphical analysis.
t. Maintaining technical and sales reference library.

RATES & CONTRACTS (Electric, Gas, Steam), RESIDENTIAL, COMMERCIAL, INDUSTRIAL, MUNICIPAL, OTHER PUBLIC UTILITIES

a. Administration and execution.
b. Cost analysis.
c. Design of rate schedules, application cards, and service terms and conditions.
d. Preparation of contracts for power, lighting, wholesale service and street lighting.
e. Estimating effect of rate changes on revenues.
f. Publicity and announcements.
g. Special reports on rate matters.
h. Investigation and research work.
i. Preparation of rate schedules for filing with commissions and general publication.
j. Following rate practices of other companies.

SPECIAL WORK.

Responsibility for the preparation of all surveys of a commercial or industrial nature, and such other special work as may be requested, ordered or approved by the client company executive.

The department is composed of specialists or key men in the sale of power, light and heat to commercial and industrial establishments, in the design of rates, drawing of contracts and conduct of special investigations. Five specialized engineers and a number of assistant engineers and cadets report to the manager. The work done is grouped under three sets of activities, as indicated on the chart. Electrical and gas appliance merchandising is conducted by the Tenney company's general sales department. The commercial and industrial department serves all client companies and others retaining the Tenney organization, besides conducting special investigations and tasks for the executives of the management group, and, as occasion warrants, carries on work involving the study of industry developments in its own field. In the field of residential rates alone fourteen investigations and reports have been made by the department within the past seven years.

Letters from Our Readers

Blueprint Ethics

To the Editor of the ELECTRICAL WORLD:

Apropos of the article on page 1358 of the Dec. 31 issue of the ELECTRICAL WORLD, I cannot resist the temptation of a few comments. The blueprint story is, in fact, but one of the many phases of a complex situation involved in buyer and seller relationships.

The viewpoint of the buyer would, in my opinion, be far more tenable provided his buying ethics do not permit him to obtain prices nor to use the drawings and general information secured from one manufacturer as a means of educating some one else of obviously inferior engineering capacity and general ability to contribute his share to the art. Obviously, in such a case the original furnisher of the blueprint would have no opportunity whatever to improve his own work as a result of drawings that might be traded to him in exchange.

The only way in which the buyer's viewpoint could be supported in practice would be to make certain that he did not request prices nor attempt an interchange of drawings excepting among those firms which were organized on a parity and whose information and general practice, to say nothing of manufacturing costs, would place them on the same plane or in the same class.

I am sure the abuse has not resulted from following this rule, but from a sometimes irresistible desire on the part of the buyer to secure a cheaper price by taking the designs prepared in one company, which is organized with an engineering overhead and cost to do business such as makes it competent, and handing them to some machine shop from which good work may be secured, but which in itself would be entirely incompetent or lacking in the ability to produce the original ideas. If the organization with a good engineering design and the ability to produce it cannot market its product based upon such design and receive its worth from the buyer, what, then, is the incentive to maintain an organization and instill within it the pride of accomplishment, to say nothing of the ability to accomplish if only for the purpose of supplying ideas for others to bid upon in competition with themselves.

After all, and as usual, it is a matter of the buying policy of the institution. Some buyers are inherently and temperamentally quick to see the justice and importance of this argument and to proceed accordingly. The buying policy, however, will not be completely corrected until it is laid down by the responsible executives themselves.

"MANUFACTURER."

Digest of Electrical Literature

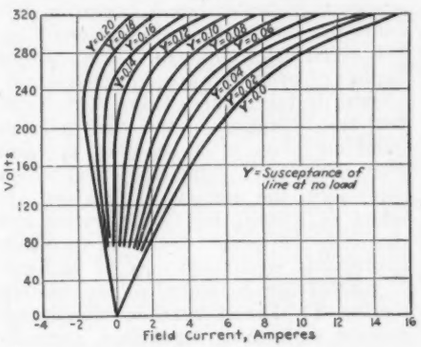
Hydro-Electric Development and Steam Equipment

A New Hydro-Electric Station.—The Norrfors hydro-electric station built by the Swedish Government operates under a fall of water of approximately 127 ft. and has a number of unusual features, including the mounting of the generator 85 ft. above the turbine. The turbines have their own guide bearings, but no supporting bearings. The total weight of the rotating part of each set is carried by special bearings provided on the generators. Each stator frame is of ordinary open construction, with small radial depth behind the core plates and furnished with a great number of openings through which the warm air can escape into a duct placed round the stator in the building but under the machine room floor. It is claimed that the machine may be regarded as completely proof against short circuit. By means of hydraulic brakes each generator may be brought to a standstill from full speed in about two minutes and can be held stationary against water leakage through the turbines when the gates are closed. Special lifting apparatus permits the whole rotating system to be raised to allow of inspection of the supporting bearing and other lower parts. The rotating load is transmitted from the shaft through a steel ring to a supporting plate of cast iron furnished on its underside with a steel surface running on babbitt-covered self-adjusting segments. The whole bearing is immersed in oil, the sliding surfaces being below the level of the oil in the well, which is surrounded with a cooling spiral fed from a forced feeding pump for all the bearings. It was found on test that the machine could be run continuously with the separate cooling device out of action.—*Electrical Review (England)*, Jan. 13, 1928.

Generation, Control, Switching and Protection

The Application of Relays for the Protection of Power System Interconnections.—L. N. CRICHTON and H. C. GRAVES, JR.—A compilation of many of the new methods for relay protection required by superpower interconnections. The ideas have been obtained from various sources and represent what seem to be good present-day practices. Particular reference is made to protection against phase-to-phase short circuits in which the current is less than the full-load current. The clearing of accidental grounds is discussed and a new study of residual currents on systems of different types is given. This study indicates the usefulness of certain inverse time-limit relays on systems having dead grounded power transformer neutrals at all switching stations. Bus protection and "back-up" methods are described. Some of the new relays which have been developed, or improvements which have been made in older types in order that the new demands may be met, are described, and there is particular mention made of a recent relay installation similar to that being used in service on a 220-kv. interconnection.—*Journal American Institute of Electrical Engineers*, February, 1928.

Alternator Characteristics Under Conditions Approaching Instability.—JOHN F. H. DOUGLAS and EDWARD W. KANE.—The subject of generator instability is discussed in connection with the method



RELATION BETWEEN GENERATOR VOLTAGE AND FIELD CURRENT WITH DIFFERENT VALUES OF LINE SUSCEPTANCE

of testing synchronous machinery in the unstable, as well as in the stable range. The results of tests performed upon several machines are given in connection with data and characteristic curves. As a result of this investigation, the authors conclude that by a reduction of the value of the transverse reaction with improved design, the production of machines of greater stability and consequent improved behavior under conditions of low leading power factor may be anticipated. It is stated that the problem of stability is likely to become more acute as the voltages, lengths of transmission line and the number of system interconnections increase, so that it is particularly desirable that the manufacturers be able to improve the stability of their machines.—*Journal American Institute of Electrical Engineers, January*, 1928.

Illumination

Tungsten Arc Lamp.—F. SKAUPY.—The glass-inclosed tungsten arc lamp is said to be gaining in popularity for purposes of projection, microscope illumination, etc. In this type of lamp two small balls of tungsten, suspended on wires which are as fine as possible, are inclosed in an evacuated glass bulb. The arc between the slightly separated balls is started by one of three methods: Ionization by an auxiliary heater, high-voltage impulse, or low-voltage glow discharge by suitable choice and pressure of the inclosed gas. Representative designs of these three classes are described. A European concern has recently perfected a tungsten arc lamp in which a bimetallic thermostat separates the electrode balls, starting the arc. Lamps of 100 to 1,000 cp. are marketed, consuming on an average $\frac{1}{4}$ watt per candle. The current rectifying properties of the tungsten arc are utilized in specially designed bulbs, for the conversion of alternating current into direct current. Such a lamp may also be connected into an oscillating circuit to change direct current into high-frequency alternating current. For example, 220-volt direct current may thus be transformed into 500-cycle alternating current with an efficiency of 35 per cent.—*Elektrotechnische Zeitschrift*, Dec. 8, 1927.

Transmission, Substations and Distribution

Power Transmission Over Long High-Voltage Lines.—G. OBERDORFER.—Simple approximation methods have been made known in late years which permit rapid calculation of the characteristics of high-voltage lines. For the sake of simplicity, certain factors were neglected and the methods were limited as to line length. The recent trend of long transmission and tie lines makes it desirable to present a method which is not limited by the length of the line, and which is, at least as accurate and simple. A graphic-vectorial method is described which fulfills these requirements.—*Elektrotechnische Zeitschrift*, Nov. 17, 1927.

Economic Base Width of Transmission Towers.—C. R. YOUNG, W. B. DUNBAR, and C. E. LEWIS.—An analysis of the various ratios utilized in the construction of transmission towers led to an investigation intended to establish an economic base width for such structures. A detailed study of the weights, specifications, and stresses, in a number of different towers resulted in the conclusion that the least-weight spread of base at the ground line of a typical square-windmill-suspension tower depends on the specification to which the tower is made, and on the slenderness ratio limits; that the reduction in the number of stories in a tower, using more stay members, and beginning the batter of tower legs at the level of the lower crossarm, has the effect of reducing tower weight, but adds to the pound cost of manufacture and erection; and that weight, in general, is saved by proportioning the diagonals to take both tension and compression, rather than tension resistance alone. Arbitrary limits with respect to slenderness ratio, areas of sections available, number of bolts practicable in end connections, and

permissible allowances for over-stressing, tend to make actual weight curves irregular and not in accordance with any continuous mathematical function. This is one of three papers in the same publication upon the subject of transmission tower design. The others treat of the behavior of model transmission towers under load, and the effective length of bracing struts in transmission towers.—*Bulletin No. 7, University of Toronto*, 1927.

Units, Measurements and Instruments

An Electromagnetic Cyclograph.—TAKEO AKAHIRA.—The instrument described in this article has been devised for the purpose of recording the relation between two given varying currents as a two-dimensional figure. In principle it is an electromagnetic oscillograph of the moving coil type. There are two single loops of four conducting strips stretched between two guide pieces of ivory and placed in a strong magnetic field. Thin and flexible cross wires are bridged over the strips of both loops midway between the guide pieces and a small circular mirror is cemented at the center of the cross fibers. The mirror vibrates around two rectangular axes simultaneously as actuated by currents passing around both loops. The current sensibilities are in the range of 0.2-2 milliamp. per millimeter of deflection at one meter scale distance and the natural frequency is about 2,000 cycles per second.—*Journal of the Institute of Electrical Engineers of Japan*, December, 1927.

Electrophysics, Electrochemistry and Batteries

The Time Lag of Spark and Surface Creepage.—MATSUNOSUKE IWATAKE.—The comparative natures of the time lag of spark between needle electrodes and sphere electrodes in air, in oil, or in solid dielectric have been investigated for several sets of conditions. The method is characterized by several features including the utilization of the positive Lichtenberg figure; the application of two parallel electrodes to the photographic plate; and the use of an induction coil as the source of potential. The time was measured by the rotating film method, which is said to be simpler and easier to apply than the Dufour oscillograph method. The author concludes that in air the time lag of a needle gap is shorter than that of a sphere gap, while in oil the time lag of the needle gap is greater when using electrodes with spherical characteristics; that the time lag of spark across a needle plane gap in air or in oil or across a needle sphere gap in air is shorter when the needle is made positive, and longer when the plane or sphere is made positive; that the time lag of spark in a solid dielectric is greater than in air, that there are few solid dielectrics which have greater value than oil; and that the time lag of a sphere gap in air or in oil does not depend upon the diameter of the spheres.—*Technology Report of the Tohoku Imperial University (Japan)*, 1927.

The Electrostatics of the Thunderstorm.—A. W. SIMON.—The author has considered the phenomena involved in lightning discharges through the use of electrostatic analyses and reference to the generation of charges and potentials, induction and precipitation of charges, sudden application of electric stress and the numerical relations as involved in the gradients and similar influencing factors.—*Journal of the Franklin Institute*, November, 1927.

Motors and Control

Electrical Equipment for Boiler House Control.—The opportunity for further economy in boiler house operation has led to the development of improved English electrical equipment. The various factors of operation are, in general, satisfactorily taken care of, but it is stated that the operation of the coal and ash handling plant is a separate problem from the control of the equipment which determines the amount of fuel and air which is actually fed to the boilers and that it is the former operation in which appreciable economies may be realized. A comparison is offered of the relative merits of: Direct current, alternating current with rotor regulation, alternating-current drive with pole-changing equipment and alternating-current computator motors, for the achievement of speed control of draught fans and other motor-driven equipment. Because of the desirability for the control of boiler house equipment from the firing floor, push-button devices are recommended for this service.—*Engineering (England)*, Jan. 20, 1928.

Heat Applications and Material Handling

Arc Welding Dynamo.—E. ROSENBERG.—The long-known "crossfield" generator, developed originally by the author for train-lighting purposes, has recently been improved for arc-welding service in which voltage regulation must be obtained with least attention. The designer succeeded in doing away entirely with all electrical regulation by equipping the generator with two magnetic poles, the flux of which can be changed mechanically to any desired density, depending upon the desired maximum welding current. The pole-pieces are attached to the yoke through thin steel tubes, within which slide steel pistons. Depending upon the position of the pistons within the steel tubes, the pole flux will be more or less restricted, thus limiting the short-circuit welding current to any desired maximum value. Hand wheels at the poles permit easy adjustment. The characteristics of such a generator are explained and presented on curve sheets. Portable sets are being manufactured with one induction motor and one or more cross-field generators. The latter can be used singly or in parallel for heavier welding work. The machines are entirely automatic, requiring no choke coils or rheostats.—*Elektrotechnische Zeitschrift*, Jan. 12, 1928, and *Elektrotechnik und Maschinanbau*, Jan. 15, 1928.

Telegraphy, Telephony, Radio and Signals

Symposium on Television.—A group of five papers describing the apparatus and methods used in the experimental demonstration of television over communication channels of the Bell System. The chief problems presented in the accomplishment of television are discussed, including the resolution of the scene into a series of electrical signals of adequate intensity for transmission, the provision of a transmission channel capable of transmitting a wide band of frequencies without distortion, means for utilizing the transmitted signals to recreate the image in a form suitable for viewing by one or more observers, arrangements for the accurate synchronization of the apparatus at the two ends of the transmission channel. Each of these factors is considered in detail with reference to the technical problems involved in their accomplishment. In the discussion of the radio transmission signals for television the engineering of a radio system for television purposes is featured and a description of the facilities actually employed in the demonstration included. The tests to which the system were submitted to determine its suitability are outlined and the measured frequency characteristics are shown.—*Reprint B-274, Bell Telephone Laboratories, Inc.*

Miscellaneous

The Dimensional Theory of Steam Nozzle Flow.—J. C. OAKDEN.—An investigation of the flow of steam through nozzle and blade passages of steam turbines. It is stated that one of the chief difficulties associated with investigations of such phenomena is the extreme complication resulting from the large number of independent factors upon which the amount of the energy loss depends. The friction loss in a steam nozzle is affected not only by the size, shape and roughness of the metal surfaces, but also by the velocity, density and viscosity of the steam at every point in its passage through the nozzle. The number of independent variables renders it difficult to compare the results obtained with different nozzles, or by different observers, since it is only on rare occasions that any two tests will be found to have been performed under exactly similar conditions. The author develops the equations and expressions for consideration in the investigation of steam nozzle flow, has enumerated the factors influencing the efficiency and has endeavored to incorporate them in the various statements.—*Engineering (England)*, Jan. 20, 1928.

News of the Industry

Federal Trade Commission to Investigate

By a Vote of 46 to 31 Senate Substitutes That Body for Proposed Committee of Upper House—Warm Discussion Rages for Nine-Hour Session

NO LITTLE acrimony characterized a protracted fight in the United States Senate on Wednesday over the amendment moved by Senator George of Georgia to substitute the Federal Trade Commission for the committee of five senators proposed in the report of the interstate commerce committee of the Upper House as the body to conduct an investigation of the electric and gas industries, inquiring into activities and relations over which the federal government has or may assume jurisdiction. The final vote came at 9 o'clock in the evening after a debate which lasted for nine hours and was marked by frequent clashes between senators who defended the Federal Trade Commission as the logical and proper body to conduct the inquiry and senators who insisted that to select it was tantamount to burying the Walsh resolution and dropping the whole matter. Finally Senator George's amendment was adopted by a vote of 46 to 31, but not before the resolution before the Senate had been altered in other respects besides the substitution of the Trade Commission for a senatorial investigating committee. The amendment was opposed by the group of Republican "progressives" and by 20 Democrats, 18 Democrats and 28 Republicans voting for it.

The resolution as passed, including the George amendment, directs the commission to inquire into and report to the Senate "within each thirty days after the passage of this resolution and finally upon completion of the investigation" on the financing of electric and gas companies furnishing power and light in interstate business. Another provision authorizes an inquiry into the alleged political activities of corporations. It was decided to limit the investigation to events since 1923, to eliminate any mention of investigating the election of House members, and to dispense with a clause which would "direct" the investigating body to go into that phase. The investigators are merely "empowered" to proceed. The Senate also accepted an amendment by Senator Black of Alabama providing that the sessions of the commission during the investigation should be open to the public.

Senator Walsh of Montana, advocating the adoption of the original resolution, declared that the scope of the investigation would not be changed by the committee amendment limiting the probe to companies doing an interstate business. It never was his intention, Senator Walsh declared, to investigate the small companies doing an entirely intrastate business. The intention is to go into the financing and other operations of the great combinations with business extending into various states. The underlying corporation that sells its securities in interstate commerce would be subject to investigation under the resolution reported out by the committee, Senator Walsh said.

Senator Walsh had much to say about the "lobby" assembled by the industries affected, but made no reference to the "lobby" of those who are urging the investigation. He cited instances in which utilities are alleged to have expended large sums in efforts to control legislation in certain states.

In the course of his remarks, the Senator from Montana declared that the Federal Trade Commission had been packed to prevent it from functioning. He made a scathing attack on Chairman Humphrey. He also criticised Commissioner Myers.

Senator George of Georgia defended the Federal Trade Commission as being a properly qualified body to continue the study which it already had started. He held the state commissions competent.

Other senators who took part were Bruce of Maryland, who assailed Senator Walsh and vigorously repudiated the allegations that a great power lobby was influencing the course of the Senate; Watson of Indiana and Copeland of New York, who favored the George amendment, and Dill of Washington, Norris and Howell of Nebraska and Blaine of Washington, who opposed it.

Text of the Resolution as Passed by the Senate

RESOLVED, that the Federal Trade Commission is hereby directed to inquire into and report to the Senate, by filing with the secretary thereof, within each 30 days after the passage of this resolution and finally on the completion of the investigation (any such inquiry before the commission to be open to the public and due notice of the time and place of all hearings to be given by the commission, and the stenographic report of the evidence taken by the commission to accompany the partial and final reports), upon: (1) the growth of the capital assets and capital liabilities of public utility corporations doing an interstate or international business supplying either electrical energy in the form of power or light or both, however produced, or gas, natural or artificial, or corporations holding the stocks of two or more public utility corporations operating in different states, and of non-public-utility corporations owned or controlled by such holding companies; (2) the method of issuing, the price realized or value received, the commissions or bonuses paid or received and other pertinent facts with respect to the various security issues of all classes of corporations herein named, including the bonds and other evidences of indebtedness thereof, as well as the stocks of the same; (3) the extent to which such holding companies or their stockholders control or are financially interested in financial, engineering, construction and/or management corporations, and the relation, one to the other, of the classes of corporations last named, the holding companies and the public utility corporations; (4) the services furnished to such public utility corporations by such holding companies and/or their associated, affiliated and/or subsidiary companies, the fees, commissions, bonuses or other charges made therefor, and the earnings and expenses of such holding companies and their associated, affiliated and/or subsidiary companies, and (5) the value or detriment to the public of such holding companies owning the stock or otherwise controlling such public utility corporations, immediately or remotely, with the extent of such ownership or control, and particularly what legislation, if any, should be enacted by Congress to correct any abuses in the organization or operation of such holding companies.

The commission is further empowered to inquire and report whether and to what extent such corporations or any of the officers thereof, or any one in their behalf or in behalf of any organization of which any such corporation may be a member, through the expenditure of money or through the control of the avenues of publicity, have made any and what effort to influence or control public opinion on account of municipal or public ownership of the means by which power is developed and electrical energy is generated and distributed, or since 1923 to influence or control elections of President, Vice-President and referred to shall be limited to the elections of President, Vice-President, and members of the United States Senate.

The commission is hereby further directed to report particularly whether any of the practices heretofore in this resolution stated tend to create a monopoly or constitute violation of the federal anti-trust laws.

First Transatlantic Engineering Session

American Institute and British Institution of Electrical Engineers Meet Jointly, Using International Radio Telephone—Symposium on Interconnection—Medals Awarded

BY MEANS of transatlantic telephony the American Institute of Electrical Engineers and the corresponding body in Great Britain, the Institution of Electrical Engineers, were enabled on Thursday morning of this week to hold a joint meeting of the two societies in New York and London. This epoch-making occurrence lent public as well as professional interest to the sixteenth winter convention of the A.I.E.E., held from Monday to Friday at the Engineering Societies Building. President Bancroft Gherardi, President F. B. Jewett and Colonel John J. Carty on the American side and President Archibald Page, Colonel T. F. Purves, of the British Post Office, and Sir Oliver Lodge on the English side exchanged greetings and indulged in spoken international amenities that were heard clearly in both countries.

When Harry P. Charlesworth, plant engineer with the American Telephone & Telegraph Company, had announced that all was in readiness, Mr. Gherardi spoke into the transmitter, saying, "Good morning, Mr. Page," to which Mr. Page responded, "Good afternoon, Mr. Gherardi." Mr. Gherardi then asked Mr. Page to preside over the joint meeting. Taking the chair in London, the British president asked the American to address the meeting. Mr. Gherardi did so briefly and Dr. Jewett and Colonel Purves followed him. Then John J. Carty moved a resolution expressing deep satisfaction with the joint session and giving form to the idea that the two societies should become jointly an agency for international good will. Mr. Page called on Sir Oliver Lodge to second the resolution, which he did felicitously. After the motion had been enthusiastically carried, Mr. Page made a few further remarks, Mr. Gherardi thanked him for presiding, and the session, which had lasted a little more than half an hour, was declared over. More than a thousand persons crowded the New York meeting, while five hundred in an overflow meeting in another room also listened to the proceedings, and a similar overflow meeting was reported from London. Just previous to the session motion pictures depicting the method of transmission were shown at both conventions.

The transatlantic messages were an interlude between the papers of the session on communication—two of these preceding and two following it.

Electrophysical Sessions

Sessions of the convention opened on Monday afternoon, when papers dealing with electrophysics and dielectrics were presented. These, as well as all the papers of the subsequent sessions, will be briefly abstracted, with a report of the discussions, in next week's Electrical World. The warmest discussion on Monday was aroused by the paper of two Russian engineers, Alexander Smouroff and Leo Mashkileison, on an investigation into the influence of internal vacua and ionization on the life duration of paper-insulated high-tension cables. This paper was read by William Del Mar, the authors having transmitted it from Leningrad. Those who discussed it held that its conclusions were somewhat invalidated by the circumstance that the tests were performed upon cable of poor quality in comparison with American standards.

Interconnection a Chief Topic

Interconnection experiences furnished the subject of an entire session on Tuesday morning, and so well were these presented that one speaker declared, amid apparent general agreement, that the papers formed the "best national presentation of the subject ever made." Four well-known engineers—the late W. C. L. Eglin (whose paper was read by Nevin E. Funk), W. E. Mitchell, H. B. Gear and P. M. Downing—covered respectively the interconnection situation in the Middle Atlantic States, the Southeast, the Chicago district and on the Pacific Coast. Nine other authorities in the utility field took part in the discussion.

On Tuesday afternoon one event was a lecture by Dr. Harold Norinder of Sweden on the use of the cathode-ray oscillograph in the study of lightning and other surges on transmission lines. The speaker urged research in the United States along the lines indicated by him, his own researches having been in some degree academic on account of the comparative rarity of thunderstorms in Sweden. Several miscellaneous treatises were also presented at this session.

Wednesday was devoted to electrical machinery, with sessions both morning and afternoon. In the evening the Edison medal was presented to William D. Coolidge and the John Fritz medal to John J. Carty. The presentation ceremonies included an address by Dr. Michael I. Pupin, who outlined the achievements of Dr. Coolidge; the presentation of the Edison medal by President Gherardi and the response of the medalist; the announcement of the John Fritz medal award by Chairman J. V. W. Reynders of the board of award, an outline of the achievements of General Carty by Mr. Gherardi, the presentation of the John Fritz medal by Robert Ridgway, chairman of the board when the award was made, and the response of General Carty.

Inspection trips to plants of the metropolitan light and power companies, the studio of the National Broadcasting Company, the Electrical Testing Laboratories and the Bell Telephone Laboratories were held, most of them on Thursday afternoon. The annual dinner-dance took place Thursday evening at the Hotel Astor, with its usual success, and a "get-together" smoker was held Tuesday evening at the same hotel. Dr. W. F. G. Swann's lecture on "The Earth's Electrical Charge," delivered Monday evening, was a graphic discussion of the electronic theory in language understandable by the laymen as well as the technicians in his audience.

Coolidge Describes His 900-Kv. Tube

Experiments with Cathode-Ray Apparatus with Three Times the Power of That Demonstrated Two Years Ago Are Recounted

IN HIS address of acceptance of the Edison medal, awarded to him "for his contributions to the incandescent electric lighting and the X-ray arts," on Wednesday evening Dr. W. D. Coolidge described a new 900,000-volt cathode-ray tube built by him with which experiments have just begun. This tube has three times the power of the 300,000-volt tube which he demonstrated in 1926. That produced enormous streams of high-speed electrons which changed gases into solids, caused many minerals to glow with phosphorescence for hours and caused profound alterations in living cells.

In his address Dr. Coolidge gave generous credit to his associates and forerunners in the work of developing high-power X-ray and cathode-ray tubes. Hitherto, he said, it had been impossible to construct tubes of very high voltage without puncturing the tube or getting the effect called the "runaway-arc discharge."

"More recently we have found that we can remove this limitation by subdividing the total potential difference applied to the tube between different pairs of tubular electrodes," he continued. "The electrons coming from the cathode are then given successive accelerations as they pass between successive pairs of electrodes. This in effect divides the tube up into sections, each of which may be good for as much as 300,000 volts. We have already successfully operated such a cathode-ray tube, with three sections, on 900,000 volts.

"This opens a vista of alluring scientific possibilities. It has tantalized us for years to think that we could not produce in the laboratory just as high-speed electrons as the highest velocity beta rays of radium and just as penetrating radiations as the shortest wavelength gamma rays from radium. According to Sir Ernest Rutherford, we need only a little more than twice the voltage which we have already employed to produce X-rays as penetrating as the most penetrating gamma rays from radium, and about 3,000,000 volts to produce as high-speed beta rays."

Quebec Fights Ottawa

Province Objects Strongly to Some of the Questions on Power Rights That Dominion Government Is Submitting to Canadian Supreme Court

A NEW development in the water-power controversy in Canada is that the Province of Quebec has raised strong objection to the draft of questions which the Dominion government has drawn up for submission to the Supreme Court in an effort to secure a settlement of the differences which have arisen between the federal and provincial governments over power rights on navigable streams, particularly the St. Lawrence River. The matter of the rights of the provinces as against the Dominion has already been before the British Privy Council—court of last resort—and the provincial interpretation is that by its judgment the beds of the rivers belong to the provinces. The Ottawa government raises several points in this regard, however. It contends especially that the St. Lawrence is and always will be a navigable river and that other matters in connection with it are merely incidental.

Considerable interest centers in the fight which is developing for the right to develop Quebec's share of St. Lawrence power. Three separate and distinct factions are believed to be clamoring for the power resources which will be developed if the St. Lawrence is deepened to the Great Lakes. The most imposing embraces what are termed the Holt interests—Montreal Light, Heat & Power, Shawinigan, etc. They are meeting competition from a newly formed group of Canadians headed by Frank P. Jones, who, it is stated, will emerge as president of the Beauharnois Power Company, which has an application before Parliament to build a combined shipway and power canal. Information in Ottawa is to the effect that the Beauharnois development is a minor step in an undertaking which is ready to invest hundreds of millions if the promoters are successful in acquiring rights. In this broader project the Sifton interests are believed to be concerned. The third factor in the situation is said to be a group of United States capitalists with unlimited backing. The weakness of their position is that they apparently are against a stone wall in the attitude of Premier Taschereau of Quebec as regards exportation of power from Quebec. However, there appears to be an impression in the capital now that international development of the St. Lawrence will include a broader policy with respect to exportation of power.

Congressional Delay on Radio Said to Threaten Chaos

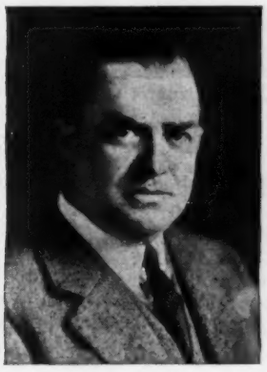
According to the National Association of Broadcasters, federal control of radio, and with it the whole structure on which broadcasting and the radio industry have been developed, is in imminent danger of collapse as a result of hesitation and delay in both houses of Congress. The association points out that although the Federal Radio Commission is supposed to consist of five members, at the present time Judge Sykes is the only member whose appointment has the seal of congressional approval. Commissioners Caldwell, Pickard and Lafount have not been confirmed, and no appointment has been made to fill the place of Admiral Bullard. If no action is taken by Congress by March 15, control will revert to the Department of Commerce, which, the association says, would have to build up a new and very extensive regional organization in order to deal with the problems still pending. The commission would on the date named become merely an appellate body. The continuation of the commission for another year, the confirmation of its members, the prompt appointment of a member from the second zone and the "removal of the threat of dishonorable discharge at the end of another year" are, the association declares, absolutely essential if radio broadcasting is not to return to the condition in which it was a year ago.

Philadelphia Electric Has New President

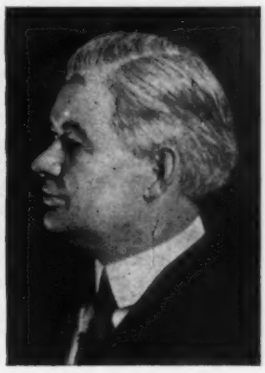
William H. Taylor Succeeds Walter H. Johnson, Who Becomes Assistant to Arthur W. Thompson, the New Chairman of the Board

IMPORTANT changes in the officers of the Philadelphia Electric Company —the outcome of the consolidation of its interests with those of the United Gas Improvement Company, which has just gone into formal effect—were announced on Tuesday of this week after the monthly directors' meeting. William H. Taylor, vice-president in charge of operation and maintenance of the U.G.I., becomes president in succession to Walter H. Johnson. Arthur W. Thompson, president of the U.G.I., becomes chairman of the board, and Mr. Johnson is named as Mr. Thompson's assistant. The position of chairman has been vacant since the death of Joseph B. McCall. Mr. Taylor on his election to the presidency resigned as vice-president of the U.G.I.

W. H. JOHNSON



W. H. TAYLOR



A. W. THOMPSON

Mr. Taylor, who is 48 years old, is a graduate of Stevens Institute of Technology and has been connected with the United Gas Improvement Company since 1903, serving in engineering and executive capacities in Omaha, Neb., Johnstown, N. Y., Charleston, S. C., Atlanta, Ga., and elsewhere. He became vice-president at Philadelphia a year ago.

In a statement to the press Mr. Taylor said: "With the hearty co-operation of the fine body of employees which has been built up for so many years by the late Joseph B. McCall and Mr. Johnson, I am confident that we shall be able to render a still higher standard of service to the consumers and the public. In its future operations the Philadelphia Electric Company will have the advice and counsel of the U.G.I. consulting organization and will be able to call upon the invaluable experience of Mr. Johnson, whose services to the company date back to the time of its organization in 1899."

Resolutions on the death of Vice-President W. C. L. Eglin, chief engineer of the Philadelphia Electric, were passed.

St. Louis Company May Develop Osage River

The Union Electric Light & Power Company of St. Louis, Mo., has for several weeks been conducting a survey to ascertain whether it can profitably develop water power on the Osage River 6 miles above Bagnell, Mo. This is the site on which a federal permit was obtained by the Missouri Hydro-Electric Power Company, whose revived plans were referred to last week (page 325). An option on this company's rights has, it is understood, been obtained by Stone & Webster, who are in agreement upon terms for turning it over to the Union Electric. A definite decision on the project will, it is reported, be made within 60 days.

The project comprehends a dam 100

ft. high, creating a lake 100 miles long, and a power house with a capacity of 100,000 hp. The entire project would cost approximately $25,000,000. Louis H. Egan, president of the Union Electric, is quoted as saying that data so far compiled indicate that the cost of power generated on the Osage River and delivered to St. Louis would be approximately the same as the cost of power generated at the Cahokia plant of his company.

At Osceola, about 40 miles southwest of Bagnell, the Ozark Utilities Company has begun the construction of a dam near the junction of the Osage and the Sac, which, it is said, will supply power to 35 towns, besides making the Osage navigable for 30 miles and the Sac for 20 miles above Osceola. L. K. Green is behind the enterprise, in which $500,000 is being invested.

Suggested Adjustment for Columbia Projects

Through the use of an amended application for water rights at "Z" Canyon, on Clark's Fork of the Columbia River, Hugh L. Cooper may expect permission from the State of Washington to proceed with plans for development of about 260,000 hp. at that point, subject to action of the Federal Power Commission. This statement was made at Spokane on Feb. 4. Mr. Cooper's application should ask the use of 7,000 sec.-ft. and an additional 1,500 sec.-ft. from the same source for 50 years, Ross K. Tiffany, State Hydraulic Engineer, was informed by the State Attorney-General's office. The "Z" Canyon project is close to the Canadian line and would entail construction of a dam 425 ft. high and 350 ft. long, the development to cost $17,600,000, it is estimated.

The Clark's Fork of the Columbia also would supply water to the Columbia Basin irrigation project at a dam at Albany Falls. Plans for the irrigation project would permit 7,000 sec.-ft. to pass after the project is developed. This accounts for the 50-year limitation on the 1,500 additional second-feet suggested for the Cooper application.

Recently the Spokane Lead & Zinc Company filed for water rights at Metaline Falls, on the same Clark's Fork of the Columbia, locally known as the Pend Oreille River. This application was confused with Cooper's in an item that appeared in these columns on Jan. 21. The site sought is a few miles upstream from "Z" Canyon and would be flooded by the Cooper development. This Metaline Falls development will be held up until final state and federal action is taken on the "Z" Canyon proposal, Eugene Logan, engineer, stated. Possibility of the mining company buying 50,000 hp. from the "Z" Canyon plant was expressed, that being the amount of power which the Metaline Falls development is designed for.

A hearing for the Federal Power Board on the "Z" Canyon proposal was called at Newport, Wash., for Feb. 16.

Purchases and Mergers

Immense North Atlantic Consolidation Talked Of—Insull Company Readjustments—Three Times Its Cost Bid for Kinston (N. C.) City Plant.

NEWSPAPER reports, apparently not without foundation, which point to a coming union of the Consolidated Gas Company of New York City (with the New York Edison and its other metropolitan electrical subsidiaries), the Brooklyn Edison Company, the Brooklyn Union Gas Company and variously named smaller utilities in territory contiguous to Greater New York are attracting wide attention. Such a consolidation would itself, according to rumor, be only part of, or preliminary to, a gigantic amalgamation reaching from Philadelphia along the Atlantic Coast to New York City and north to Albany, and including all the largest groups in this stretch of territory. This possibility—involving rather a bankers' than an operators' negotiation—is discussed in more detail under "Financial and Statistical News" (page 377).

The National Electric Power Company, now an Insull property, makes two announcements concerning readjustment of Insull holdings which are of interest. The first is that the National Electric Power Company has acquired a substantial majority interest in the common stock of the New England Public Service Company, whose subsidiaries furnish electric service to an extensive territory in Maine, New Hampshire, Vermont and New York. The second is that the National Electric Power Company has disposed of its properties west of the Mississippi River to the Middle West Utilities Company of Chicago. These properties are the Northwestern Public Service Company, operating in 100 communities from the North Dakota line down into Nebraska; the Watertown (S. D.) Public Service Company; the Kansas Electric Power Company, operating in Lawrence, Parsons, Emporia, Leavenworth and other Kansas communities, and the Southwest Power Company, operating in Oklahoma and Arkansas.

When bids for the Kinston (N. C.) municipal electric plant were opened on Feb. 6 it was found that several bidders had offered more than $1,000,000. R. Livingston of New York and E. C. Gregory of Charlotte made the high bid—$1,357,000—agreeing also to construct a "white way" and other improvements. The City Council, however, accepted the Carolina Gas & Electric Company's bid of $1,271,000 and "extras," subject to approval of the voters at a special election. Messrs. Gregory and Livingston have protested. The plant cost about a third of the sum offered. The municipal ownership element is strong in Kinston, and it is by no means certain that the bid will be accepted, despite its size.

The Illinois Power & Light Corporation acquired seven small private companies and one municipal lighting plant in central Illinois last year, while the North American Light & Power Company, of which the Illinois Power & Light is a subsidiary, acquired two private concerns, serving four towns. The Weldon plant was the municipal concern acquired, this purchase having been made quite recently. The Cisco and Maroa Electric Light Companies, which maintained only distribution systems; the Bondville Electric Light Company and the Seymour & White Heath Electric Light Company, also distributors in the Champaign district, were acquired, and in the Bloomington section the Shirley Light & Power (serving Funk's Grove also), the Stanford Electric Light, Power & Heating Company and the Carlock Electric Light & Power, which also served Congersville and the Mackinaw Dells rural community, were taken over. The North American took over the Prather & Hill Electric Company, serving Sherman, Williamsville and Broadwell, and the Elkhart Electric Light Company.

The Public Service Commission of New Hampshire has approved the purchase of the Ossipee (N. H.) Water & Electric Company, by the Public Service Company of New Hampshire for $30,000.

Is New York's "Great White Way" to Disappear?

At a meeting of the New York Section of the Illuminating Engineering Society on Feb. 9 E. G. B. Fox of the Edison Lamp Works of the General Electric Company at Harrison, speaking on "Electrical Advertising Activities," called attention to the fact that in New York City there is pending a restriction that will blot out all electric signs in the heart of the city, including a long section of Broadway north and south of Forty-second Street. Mr. Fox said that the number of illuminated signs in 1926 in the United States was 425,000. It was estimated that these signs contained about 22,000,000 sockets, that the average wattage per lamp was 17 and that revenue from these signs was $28,000,000. Increase in electrical advertising in 1927 should mean to the sign manufacturer a business of $15,000,000, he thought. Mr. Fox referred to the need for a model sign ordinance that will safeguard the public interest and give the electrical sign industry a solid foundation on which to build.

F. E. Carlson of the National Lamp Works of the General Electric Company, Cleveland, spoke on "Design, Methods and New Developments in Electrical Advertising." He illustrated his talk with a series of lantern slides.

W. J. Moore of the Society for Electrical Development referred to the central station's part in the sign business and cited the example of a company serving a town of 100,000 population which in 1922 added to its revenue from signs installed in that year the sum of $450. In 1927 the revenue from signs installed during that year was $40,000, and for 1928 a quota of $50,000 has been set. Mr. Moore said that this great increase was owing entirely to the attitude of the central-station company toward the sign business and was typical of what could be done by other companies

Wisconsin Water Power

Interim Committee of Legislature Will Begin Hearings Next Week—Forty-eight Undeveloped Hydro-Electric Sites Discovered

PUBLIC hearings by the legislative interim committee which has been delegated to investigate the operations of the electrical industry in Wisconsin will, it is reported, begin on Feb. 23. Originally the committee intended only to investigate the practicability of taking over the water powers for the state, but it is understood that a decision to broaden the scope of the investigation has been reached.

There are now in Wisconsin 48 unused water-power sites, according to Alvin C. Reis of Madison, secretary of the committee. These are on the following streams and rivers: St. Croix, two sites; Namekagon, one; Chippewa, seven; Flambeau, ten; Red Cedar, four; Wisconsin, seven; Tomahawk, one; Wolf, five; Oconto, two; Peshtigo, four, and Menominee, five. In addition to these there are seven undeveloped sites on boundary streams of the state.

Mr. Reis, in discussing the work of his committee, pointed out that one of the most important phases of this question to his state is the decision of the United States Supreme Court sustaining the recapture clause of the Wisconsin law. This clause provides that a state may recapture a water-power site from a private corporation after a lapse of 30 years by paying the original franchise value. "This means," Mr. Reis said, "that the state can have a permanent water-power policy on a basis of a reasonable initial cost, the unearned increment going entirely to the state." After water-power sites shall have been recaptured by the state Mr. Reis believes the state could either lease them again to private companies with a proportionate increase of rates to accord with the increased value of the property or, under proper legislation, could operate them directly, just as cities operate their municipal waterworks. Although the recapture clause affects only those sites whose franchises have been in operation for 30 years, Mr. Reis said that other sites could be taken over by the state by condemnation. Such water-power sites would have to be paid for at their present valuation rather than at the value placed upon them at the time the franchises were granted.

Before the state can purchase such properties or launch upon an enterprise of state-owned power-producing companies, it will be necessary to have constitutional authority for such activity, Mr. Reis added, since there is a provision in the constitution which prohibits the state from expending money for or engaging in any work of internal improvement other than road and forest preserves. It was the intent of a joint resolution introduced at the last session of the Legislature by Mr. Reis to give the state authority to acquire, construct and maintain water-power plants for the furnishing of light, power and heat to the public. This resolution, although it passed the Assembly, was killed in the Senate. Two-thirds of the water power of the state is already under private or municipal control, according to him.

Edison Pioneers Gather

Early Associates of the Inventor Meet in New York to Celebrate His Eighty-first Birthday—Edward Dean Adams Elected President.

ABOUT 150 persons—members of the Edison Pioneers, their families and friends—met at luncheon at the Hotel Astor, New York, on Saturday, Feb. 11, in celebration of the eighty-first anniversary of the birth of Thomas A. Edison and for the annual meeting of the society. From his winter home at Fort Myers, Fla., Mr. Edison sent this message:

"I am glad to hear from my old boys

EDWARD D. ADAMS

and appreciate your congratulations and good wishes. Regret I cannot be with you today, but have no doubt you will enjoy meeting each other again. I am having a fine time on my present job. Cordial regards to you all."

W. H. Meadowcroft, historian and retiring president of the organization, presided at the luncheon and described the inventor's latest undertaking, which has for its aim the production of rubber from American-grown weeds, vines, shrubs and bushes.

Among those present at the luncheon were Edward D. Adams, W. S. Barstow, Charles L. Edgar, Thomas A. Edison, Jr., Charles Edison, C. E. Estabrook, W. J. Hammer, Joseph Insull, Francis Jehl, Walter H. Johnson, Peter Junkersfeld, Isaac Krall, John W. Lieb, W. S. Mallory, Preston S. Millar, F. A. Scheffler, F. A. Wardlaw, Theodore Beran, James Burke, Douglass Burnett, Adolph Hertz, J. J. Kennedy, A. W. Kiddle, Hermann Lemp, James Lyman, H. V. A. Parsell, Theodore Stebbins, C. W. Stone, W. G. Wetmore and Arthur Williams.

Edward Dean Adams, the veteran who played a leading part in the development of power at Niagara Falls, was elected president for the ensuing year; Sydney B. Paine, William H. Francis, Walter S. Mallory and Francis Jehl vice-presidents; F. A. Wardlaw secretary and Charles E. Estabrook treasurer.

Illinois State Electric Association Meets March 14-15

The eighth annual joint convention of the Illinois State Electric, Illinois Electric Railways and Illinois Gas associations will be held at Springfield on March 14 and 15. Two general sessions in the mornings will take place at the Hotel Abraham Lincoln with addresses by presidents of the associations and others. In the afternoons the associations will meet separately, the State Electric Association assembling at the St. Nicholas Hotel to listen to reports and papers as follows:

WEDNESDAY, MARCH 14

Report of industrial relations committee, Robert Hallenberg, Illinois Northern Utilities Company; "Street Lighting as a Source of Revenue," R. J. Malcomson, Public Service Company of Northern Illinois; "Residential Refixturing in Illinois — Present Status and Market," R. G. Raymond, Electric Association, Chicago.

THURSDAY, MARCH 15

Final report on Illinois experimental farm line, Prof. E. H. Lehmann, University of Illinois; "Proposed Accounting in Connection with Farm Lines," J. Paul Clayton, Central Illinois Public Service Company; "Progress in Connection with Superpower Transmission Developments," E. S. Hight, Illinois Power & Light Corporation.

Commonwealth Power Is to Spend $25,000,000 in 1928

Subsidiaries of the Commonwealth Power Corporation plan to spend approximately $25,000,000 in 1928 for additions and improvements. About 70 per cent will be for the electric department. The more important projects contemplated include immediate additions to the steam-electric generating stations at various points in the territory served. Preliminary work will be started on the construction of a new dam and hydro-electric installation on the Muskegon River in Michigan to have a capacity of 35,000 hp. This job when completed will be the largest hydro-electric development in Michigan. Large expenditures also will be made in Michigan, Tennessee, Ohio, Illinois and Indiana for substations, transmission and distribution lines and other equipment.

The operating subsidiaries of the Commonwealth Power Corporation include the Consumers Power Company, with headquarters in Jackson, Mich.; the Tennessee Electric Power Company, Chattanooga; the Ohio Edison Company, Springfield, Ohio; the Southern Indiana Gas & Electric Company, Evansville; the Central Illinois Light Company, Peoria; the Illinois Electric Power Company, East Peoria, and the Illinois Power Company, Springfield, Ill.

Briefer News

TRANSMISSION EXTENSIONS IN TENNESSEE.—A 66,000-volt transmission line of the Jackson (Tenn.) Railway & Light Company between Brownsville and Ripley, Tenn., has just been completed, and work is starting on a 110,000-volt line from Memphis to Ripley.

BUFFALO GETTING RID OF HER GAS LAMPS.—Adam B. Gunn, superintendent of distribution of the Buffalo General Electric Company, says in a recent report that 3,510 electric street lamps were installed in Buffalo in 1927. The great majority of these were for new streets in the northern and eastern portions of the city. Buffalo gas lamps are being quickly converted to the electric type.

PROJECTED HYDRO PLANT FOR EEL RIVER, CALIF.—The Benbow Power Company has applied to the California Railroad Commission for authority to engage in the distribution of electric light and power in Humboldt and Mendocino Counties. The applicant proposes to construct a dam across the South Fork of the Eel River at a point approximately 2,600 ft. west of Benbow and to construct a hydro-electric power plant, but pending its construction to operate a Diesel-engine plant.

WELL-SALTED POLES APPEAL TO OREGON STOCK.—Range horses and cattle in southern Oregon are being supplied with rock salt at the expense of the California-Oregon Power Company in order that the stock may be allured away from the utility's transmission-line poles, which have been treated with a saline solution. The animals, discovering the salt on the poles, began chewing the wood, and considerable damage resulted before the company solved the problem by liberally salting the territory.

KENTUCKY LEGISLATURE MAY BROADCAST ITS PROCEEDINGS.—It is announced that a joint resolution will be introduced in the Kentucky General Assembly at the present session providing that $15,000 be appropriated and a commission of three, to serve without pay and to be appointed by the Governor, named for the purpose of installing and looking after a radio broadcasting station, to be used during the regular and special sessions of the Kentucky Legislature, by the House and Senate, to keep the public informed of what is being done at Frankfort.

SWEDEN HAS NEW ELECTRICAL PAPER.—The Association for Rational Utilization of Electricity has been founded in Sweden along lines corresponding in some ways to the Society for Electrical Development. It is backed by the Swedish national central-station and electrical-industrial associations and has begun the publication of an independent semi-popular electrical engineering paper called *Era*, an abbreviated form for *Tidskrift för Elektricitetens Rationella Användning*. Of this paper Edy Vilander is editor. Mr. Vilander spent several years in the United States, during part of which he was associated with Dr. A. E. Kennelly in laboratory experiments at Harvard University.

POTOMAC ELECTRIC COMPANY ORDERS ANOTHER 30,000-KW. UNIT.—The Bennings station of the Potomac Electric Company at Washington, D. C., is to have a second 30,000-kw. turbo-generator unit. It is to be of General Electric manufacture and will be identical in rating and steam conditions with the one installed last December.

NEBRASKA MUNICIPAL SYSTEM GOES ON LINES FROM GOVERNMENT PLANT.—The Gering (Neb.) municipally operated plant has abandoned the manufacture of electrical energy and contracted with the government for electricity from the irrigation dam at Guernsey, Wyo. This has been followed by a reduction in rates. Gering owns its distribution system and will hold its plant in reserve.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see ELECTRICAL WORLD for Jan. 7, page 80.]

Northwest Electric Light and Power Association — Commercial Section, Portland, Ore., Feb. 20 and 21; Engineering Section, Spokane, Wash., March 8 and 9. Berkeley Snow, 1208 Spalding Building, Portland, Ore.

New Mexico Utilities Association—Albuquerque, N. M., Feb. 20-22. Arthur Prager, Albuquerque Gas & Electric Company, Albuquerque.

New England Central Station Association of Power Engineers—Engineers' Club, Boston, Feb. 29. T. D. Bond, C. H. Tenney & Co., Boston.

American Institute of Electrical Engineers—St. Louis regional meeting, March 7-9; Baltimore regional meeting, April 17-19; New Haven regional meeting, May 9-11. F. L. Hutchinson, 33 West 39th St., New York.

Oklahoma Utilities Association—Mayo Hotel, Tulsa, March 13-15. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

Illinois State Electric Association—Hotel Abraham Lincoln, March 14-15. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

National Electrical Manufacturers' Association—Policies Division, Edgewater Beach Hotel, Chicago, March 14-16. S. N. Clarkson, 420 Lexington Ave., New York.

International Association of Electrical Inspectors—Madison, Wis., March 17-18. W. Wilke, 4211 Eiring Place, Milwaukee.

Maryland Utilities Association—Emerson Hotel, Baltimore, March 23. G. S. Williams, 1005 Continental Bldg., Baltimore.

Southwestern Division, N.E.L.A. — Edgewater Gulf Hotel, Biloxi, Miss., April 3-5. S. J. Ballinger, San Antonio Public Service Company, San Antonio, Tex.

Nebraska Section, N. E. L. A.—Omaha, April 4 and 5. T. E. Browne, 1527 Sharpe Bldg., Lincoln.

Southeastern Division, N. E. L. A.—Miami, Fla., April 11-14. C. M. Kilian, 207 Bona Allen Bldg., Atlanta.

American Electrochemical Society—Bridgeport, Conn., April 26-28. C. G. Fink, Columbia University, New York.

Missouri Association of Public Utilities—Jefferson City, April 26-28. F. D. Beardslee, 315 North Twelfth St., St. Louis.

Middle West Division, N.E.L.A.—Hotel Statler, St. Louis, May 9-11. T. A. Browne, 1519 O St., Lincoln, Neb.

CANADIAN NIAGARA POWER COMPANY BUILDING NEW OFFICES.—Work is progressing rapidly on a new office building for the Canadian Niagara Power Company at Fort Erie, Ontario. The building, which will be a short distance from the Canadian end of the new Peace Bridge, will probably be completed by March 1. Built in Spanish design and finished in stucco with stone trim and tile roof, it will give facilities for displaying electrical appliances and will also afford ample office space.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY TO CONNECT LINES WITH POWERTON.—The Central Illinois Public Service Company has obtained authority from the Illinois Commerce Commission to construct and operate a 33,000-volt transmission line in Fulton, Mason and Tazewell Counties connecting its present distributing system with the new power plant at Powerton. Principal lines will extend from Powerton to Canton and from Powerton to Havana.

MAYOR OF TOLEDO OPPOSES "EXTRAVAGANT" LIGHTING.—Declaring that to place two electric lamps on each pole in a system where the poles are 100 ft. apart is an extravagant use of public money, Mayor Jackson of Toledo, Ohio, has vetoed an ordinance for a "white way" on Monroe Street. He says that a single lamp to a pole is enough and that 282 lamps, as planned, are too many. "The city's street-lighting bill is now reaching a huge sum," the Mayor said, "and it is becoming a heavy burden upon the taxpayers of the city."

CINCINNATI RATE DISPUTE GOES TO SPECIAL MASTER.—Appointment of a special master to examine the suit brought by the Union Gas & Electric Company against the city of Cincinnati in regard to reduced rates for electricity, as imposed in a recently passed city ordinance (ELECTRICAL WORLD, Oct. 29, page 904), was agreed to by counsel representing both parties in the United States Court at Cincinnati last week. A great mass of data is to be examined, and no definite date for court hearing was set.

DIVIDED AUTHORITY OVER OREGON UTILITIES BRINGS SUGGESTED LEGISLATIVE REMEDY.—An amendment to the Oregon utilities commission code which will vest the department with authority to regulate and supervise utility financing, purchases, sales and mergers will again be recommended to the 1929 Legislature. Commissioner H. H. Corey has submitted this amendment at previous sessions, but the authority still rests in the hands of the State Corporation Commission as regards the extent of bond and stock issues. The Corporation Commissioner, however, favors

a plan either to extend the authority of the regulatory department in regard to transfers and mergers of utility properties or to place the entire matter of financing under the direction of the Corporation Commission.

LITCHFIELD (CONN.) CUSTOMERS GET OPTIONAL RATES. — The Connecticut Public Utilities Commission has decided that a new rate schedule of the Litchfield Electric Light & Power Company shall be optional with customers, who may stay on the former schedule if they wish, and a petition to upset the new rates was withdrawn. The optional plan is to have a trial of one year.

HOUSTON WILL START "WHITE WAY" FOR DEMOCRATS.—Houston, Tex., is to install 88 new double-standard 2,000-cp. lamps on Main Street between Franklin and Polk Avenues in preparation for the National Democratic Convention, which will be held in the Texas city in June. This will give Houston a modern "white way" of an imposing kind.

PROPOSED 90-MILE TRANSMISSION LINE IN SOUTH ALABAMA.—The Alabama Power Company has authorized a right-of-way survey for the construction of a 90-mile power transmission line from Linden to Jackson, Ala., via Thomasville. The cost is estimated at $400,000. The company owns plants at both Thomasville and Jackson, but they have been isolated from its main power transmission system.

SOUTHEASTERN POWER COMPANY BEHIND SAVANNAH RIVER PROJECT?—According to a dispatch from Greenwood, S. C., the 120,000-hp. hydro-electric project of the Savannah River Electric Company, for which a license was granted in January by the Federal Power Commission, has the backing of the Southeastern Power Company, of which the Georgia Power and Alabama Power companies are subsidiaries. The site is at Clark's Hill, 15 miles above Ausgusta, Ga., where a 90-ft. dam will be built, forming a reservoir which will cover 40,000 acres.

PUBLIC UTILITY COMMISSION DEMANDED FOR TEXAS. — Major Alfred Petsch of Fredericksburg, Tex., administration leader in the State Legislature, predicts that Governor Dan Moody will champion a measure to create a state public utility commission. "The most important economic matter to come before the Legislature will be the regulation of public utilities," Mr. Petsch says. "The Railroad Commission, hog-tied by constitutional limitations and personnel, is hopelessly inadequate. We must have a public utility commission which will have jurisdiction over all public utilities as the Railroad Commission now has over railroads. This is of supreme importance to the interests of the people and to the honest and fair utility. A constitutional amendment is the only solution of this question. There will be enough opposition in the Legislature by those utilities which, for various reasons best known to them, want no regulation at all to defeat the resolution in the Legislature unless the Governor champions the measure. It is safe to predict that the leadership of the Governor may be expected in favor of creating a public utility commission."

SHIPPING 16-FT. WHEEL FROM PHILADELPHIA TO THE TALLASSEE.—One of the largest waterwheels to be cast, shipped and operated in one piece has been received at the Upper Tallassee hydro-electric development of the Alabama Power Company, now being reconstructed to produce 50,000 hp. The wheel, the first of two to be installed, weighs 130,000 lb. and required a special freight car for handling. Its largest diameter is 16 ft. and its extreme height is 10 ft. 3 in. Owing to its dimensions, the waterwheel, made by the I. P. Morris Corporation of Philadelphia, had to be shipped from Philadelphia to Cape Charles, Md., from there across the Chesapeake Bay by boat to Norfolk, Va., and thence by rail to Tallassee. This took seven days. It was in process of manufacture from early June until December.

UNIVERSITY OF WISCONSIN TO CONDUCT ITS FIRST SHORT COURSE IN ELECTRIC FARMING.—Third among American universities to conduct short courses in rural electrification, the University of Wisconsin held one on Feb. 14-16, in order further to promote the use of labor-saving devices on farms and in farm homes and to guide farmers in purchasing electrical equipment. University professors, light and power men and manufacturers' representatives took part in the discussions. The first of these courses was held last October at Purdue and the second was held on Jan. 23-28 at the Oregon State Agricultural College.

ERIE (PA.) COMPANY TO BE ADVISED BY U.G.I. OFFICERS.—An unusual contract has been signed by the United Gas Improvement Company and the Erie County (Pa.) Electric Company under which the U.G.I. will act as consultant and assist in the management of the Erie company, according to an announcement by Arthur W. Thompson, president of the U.G.I. This agreement, signed by Mr. Thompson and Charles H. Strong, president of the Erie County Electric Company, provides that the Erie company, which supplies power in that city and vicinity and is owned, operated and controlled by Erie citizens, shall receive the advice and assistance of U.G.I. management in the operation of the property, although that organization has no financial interest in the Erie property.

NORTH CENTRAL MEN HOLD MEETING AT ST. CLOUD, MINN.—About one hundred members attended a sectional conference of the North Central Electric Association at St. Cloud, Minn., on Feb. 15. Wheelock Whitney, Northern States Power Company manager at St. Cloud, was to preside. The program included illustrated lectures by C. P. Wagner of Minneapolis on "Developments in Rural Electrification" and by Secretary John W. Lapham on "Some Developments in the Electrical Industry." Round-table discussions covered the sale of electric cookery, better lighting and appliances and a general discussion on "Company and Dealer Co-operation," as well as a talk on reducing transmission losses by J. A. McCutcheon.

MANITOBA GOVERNMENT WANTS SEVEN SISTERS FALLS SITE.—A complete survey of the water-power resources on the Winnipeg River and an estimate of the cost of development of the Seven Sisters Falls site in northern Manitoba, including, if necessary, expropriation of the Pinawa plant of the Winnipeg Electric Company, will be made by T. H. Hogg, chief hydraulic engineer of the Ontario Hydro-Electric Power Commission. This decision has been reached as a result of a conference between Mr. Hogg and members of the Manitoba government. Premier Bracken of Manitoba had wired the federal government urging that no lease of the power site at Seven Sisters Falls be granted to the Winnipeg Electric or any other company inasmuch as the provincial government plans to develop the site.

TRANSATLANTIC TELEVISION. — A demonstration of transatlantic television using apparatus invented by John L. Baird of England was made last week in the home of R. M. Hart, a short-wave radio operator in Hartsdale, N. Y., just outside New York City. The demonstration was witnessed at the American end by an Associated Press man, who reported that on a whirling screen, about 6 in. by 4 in., installed in Mr. Hart's cellar, two outlines of heads became visible as the result of the conjunction of innumerable points of light. In neither case could the features be clearly discerned, though it was said to be evident that one head was a man's and the other a woman's. Capt. O. G. Hutchinson, manager for Baird's company, was elated over the results and, it is said, predicted that with more power (only 2 kw. was available from

the London station) transatlantic television would shortly approach perfection and that in a short time two-way television across the ocean would be a commonplace.

QUEBEC UTILITY MEN COMPLAIN OF UNFAIR TAXATION COMPARED WITH ONTARIO HYDRO.—An influential deputation from the Province of Quebec, consisting mainly of representatives of various public utility companies, waited upon the federal government in Ottawa on Jan. 11 and urged that users of privately owned electrical energy in Quebec be given the same immunity from taxation on its cost as is enjoyed by the users of publicly owned energy in Ontario. Several of the spokesmen deplored the advantage that Ontario had over Quebec in attracting United States industries and capital, when Ontario could tell them that they would not have to pay a tax on their electricity, while in Quebec the handicap in this respect amounted to $3 a year for every consumer of electric power. The Minister of Finance, replying, dwelt on the difference in the cost of power between the two provinces and appeared disinclined to remit the tax.

"COUNTED-ROOM" RATE TO BE INTRODUCED AT SCHENECTADY.—The Public Service Commission of New York has approved a new rate schedule of the New York Power & Light Corporation for electric service supplied in the Schenectady district. This schedule, effective March 1, provides for residential service on the "counted-room" basis. The rate is to be 25 cents per counted room per month (minimum three counted rooms), plus 5½ cents per kilowatt-hour for the first 10 kw.-hr. per month per counted room and 3 cents for excess consumption per month. A basis is provided for the determination of counted rooms. A "delayed-payment" excess of 2 per cent—but not less than 25 cents—is allowed. The present rate for residence lighting is 10 cents for the first 30 kw.-hr. and descending steps to 5 cents for all over 2,000 kw.-hr.

WATER-POWER RESOURCES OF MOLALLA RIVER BASIN, OREGON.—At five proposed power sites in the Molalla River Basin, Oregon, the potential power will amount to 38,900 hp. for 50 per cent of the time and 13,000 hp. for 90 per cent of the time, if the flow shall be regulated by the construction of the Pelkey Reservoir, according to a report by R. O. Helland made in connection with the classification of public lands by the Geological Survey, Department of the Interior. The report proposes a dam 260 ft. high at the Pelley site, which would make available 2,960 hp. for 90 per cent of the time and 4,830 hp. for 50 per cent of the time at 70 per cent efficiency. If the height of the dam were increased to 310 ft., it would double the storage and potential power. As Molalla River is close to Portland, power developed in the basin could be transmitted to that city at a low cost.

Recent Court Decisions

"WILLFUL FAILURE" TO OBSERVE SAFETY RULES MEANS MORE THAN NEGLIGENCE.—In Knoxville Power & Light Company vs. Barnes, an appeal from an award under the workmen's compensation act, the Supreme Court of Tennessee, commenting on the contention that a workman's injury had resulted from refusal to use safety appliances furnished by his employer, drew a destinction between "willful failure" to do so and negligence founded on a false idea. The case in question was one where a lineman did not don rubber gloves because he had been told certain electric lines had been killed. The court found him entitled to compensation under the law. (299 S.W. 772).*

WHERE THERE IS FAILURE TO PROVE CONTRIBUTORY NEGLIGENCE, ERRORS IN INSTRUCTION ON SUCH NEGLIGENCE ARE WITHOUT PREJUDICE.—The suit of Young vs. Vallejo Electric Light & Power Company, reported in the ELECTRICAL WORLD for Nov. 26 (page 1114), came before the Supreme Court of California on appeal. Finding for the plaintiff was affirmed. The argument was on the matter of contributory negligence and the trial judge's instructions on the point. The Supreme Court held that the question was removed from the jury's consideration by the failure of the defendant to show the existence of such negligence and that, this being so, any errors in the judge's charge were immaterial. The case arose because of the transmission of electricity over wires resting on the roof of the plaintiff's house. (262 Pac. 327).

NEW JERSEY COMMISSION'S DIVISION OF TERRITORY UPHELD.—The New Jersey Supreme Court has upheld the State Board of Public Utility Commissioners in fixing the territorial boundary line in the borough of Spring Lake for the supply of electrical energy as between the Jersey Central Power & Light Company and the Eastern New Jersey Power Company. In December, 1926, the board ruled that the two companies should divide the electric business of Spring Lake (ELECTRICAL WORLD, Jan. 15, 1927, page 170). Spring Lake and the Eastern New Jersey Power Company attacked the ruling, the borough claiming that the utility board was attempting to control lighting of its streets and the power company contending that its property was being taken without due process of law. The Supreme Court held that these were unwarranted asumptions.

DOCTRINE OF TRESPASS—NERVOUS INJURIES A CAUSE FOR RECOVERING DAMAGES.—The Supreme Court of Vermont reversed a directed verdict for defendant in Humphrey vs. Twin State Gas & Electric Company. In this case a temporary transmission line belonging to the company sagged owing to the breaking of a tie wire and made contact with a wire fence. The plaintiff and a companion, while on a hunting trip, trespassed on land traversed by the fence and the plaintiff was injured and the other man killed because of contact with the fence. The Supreme Court of Vermont held: (1) that there was a prima facie case for the jury under the doctrine of *res ipsa loquitur* (the thing speaks for itself); (2) that the fact of trespass on a third party's land did not absolve the company from liability; (3) that evidence to the effect that plaintiff on regaining consciousness was affected by seeing his companion dead was admissible both as proving the intensity of the electric shock and as showing a cause contributing to the disturbance of plaintiff's nervous system; (4) that plaintiff was entitled to recover for both physical injuries and nervous injuries occasioned by defendant's negligence. (139 At. 440).

CASUALLY PLACING HAND ON ELECTRICAL APPARATUS EXPOSED ON STREET NOT CONTRIBUTORY NEGLIGENCE.—In Johnson vs. East Texas Public Service Company the cutting of a guy wire by a telephone company had caused a short circuit which charged a hook used by the defendant, a light and power company, to raise and lower a street lamp. This hook was fastened on a pole six feet above the ground. While talking with another man on the street the plaintiff casually brought his hand into contact with the hook or the chain attached to it and was knocked down and severely injured. The Court of Civil Appeals of Texas sustained a judgment for damages, holding the plaintiff not guilty of contributory negligence. It also agreed in absolving the telephone company of responsibility, since two weeks elapsed between its severance of the guy wire and the accident, thus making any negligence by the telephone company antecedent and remote. The absence of strain insulators and the fact that there was plenty of time for the defendant company to have discovered and remedied the dangerous condition were ground for the jury's finding. (300 S.W. 975.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

METER READERS MUST NOT ENTER PREMISES WITHOUT OCCUPANTS' PERMISSION.—Meter readers for public utility companies do not have a right to enter any home in Kansas without first notifying the owner or occupant. This was the ruling of the Kansas Public Service Commission in a written communication to the Mayor of Haddam, who complained that meter readers for an electric light company carried skeleton keys and used them to enter homes at any time they were making rounds. Patrons of the company complained of this practice, and it was alleged that a local manager maintained that the readers had the right to enter a home at any time and without notice. The commission directed that meter readers give notice of their presence and that they must not enter homes without permission.

ADEQUATE SERVICE INSISTED ON.—Orders requiring the Dakota Public Service Company to take steps immediately to improve electric service furnished by it at Hettinger and Reeder have been issued by the North Dakota Board of Railroad Commissioners following a hearing at which citizens of the two cities detailed incidents of alleged poor service. It is the duty of a public utility to provide itself with adequate facilities for furnishing efficient service, the board said, and the company was instructed to install a new generating unit as quickly as possible, to improve the distribution service and to make weekly reports to the commission showing progress.

News About Men of the Industry

H. J. WOODARD has been appointed auditor of the Georgia Power Company, succeeding F. A. BRINE, who retired on account of ill health.

THOMAS AHEARN, president of the Ottawa Light, Heat & Power Company, has been made a member of the Canadian Privy Council, a high political honor.

PERRY T. KNIGHT of Valdosta has been appointed a member of the Georgia Public Service Commission to succeed the late O. R. Bennett.

WALTER H. SMITH has resigned from the Westinghouse Electric & Manufacturing Company, where he was connected with the railway equipment division, to join the engineering staff of the Reading Company in connection with the electrification of the Reading Terminal at Philadelphia.

LESTER HOOKER, senior member of the Virginia State Corporation, was named chairman of that body on Feb. 1. On that date WILLIAM MEADE FLETCHER was sworn in as a member, succeeding BERKLEY D. ADAMS, who had been chairman for the previous two years.

E. W. SWEEZY has been named president and general manager of the Suburban Light & Power Company, Cleveland, recently purchased by New York men through a transaction negotiated by Love, Macomber & Company of New York. Mr. Sweezy was formerly identified with public utility properties in Alliance, Ohio.

UNIT RASIN, for the past fifteen years district manager of the Westinghouse Lamp Company in Philadelphia, has resigned. Mr. Rasin is well known in electrical manufacturing circles in the Philadelphia district, his sales work for the Westinghouse company having brought him in close contact not only with the jobbers and dealers but also with the industrial plants in that territory.

E. A. ARMSTRONG, formerly power engineer of the Public Service Company of Northern Illinois, has been appointed manager of power sales. A graduate of Michigan Agricultural College in electrical engineering, Mr. Armstrong became associated with the Public Service Company in 1920 in the capacity of power salesman. It was in 1924 that he was appointed power engineer.

ALBERT H. MANWARING, who recently retired after 46 years of service with the Philadelphia Electric Company, was the guest of honor at a luncheon given by his fellow employees at the Penn Athletic Club. Among those present were Walter H. Johnson, president; A. B. Huey, H. P. Liversidge and W. E. Long, vice-presidents; A. V. R. Coe, secretary, and H. C. Lucas, treasurer. A. R. Granger, vice-president of the Delaware County Electric Company, subsidiary of the Philadelphia Electric Company, acted as toastmaster and on behalf of Mr. Manwaring's fellow workers presented to him an electrically operated radio.

J. A. Hunnewell New President of Lowell Utility

John A. Hunnewell, whose election as president of the Lowell (Mass.) Electric Light Corporation was recently announced, is one of the best known resident managers of the East in the Stone & Webster group. He was born 50 years ago at Scarboro, Me., was educated at Bates College and shortly after graduation entered the employ of Stone & Webster. In 1906 he was made manager of the Lowell company and has been prominently identified with the growth of this organization and to a large extent responsible for its prosperity and good public relations, besides taking an active part in civic affairs. His interest in employees has been expressed in many ways, perhaps the most prominent of which has been in the personal conductorship for some years of an unusually fine orchestra composed of members of the Lowell company's rank and file. He was recently made vice-president of the Lowell Gas Light Company, but with the acquisition of the electric company by the New England Power Association he resigned from this post and severed his connection with the Stone & Webster organization.

J. A. HUNNEWELL

W. R. G. BAKER has been appointed managing engineer of the radio department of the General Electric Company to succeed Adam Stein, Jr., who has joined the executive staff of the Acoustics Products Company. Mr. Baker has been in the employ of the General Electric Company for eleven years and he has been connected with the company's radio development work since 1918. He accompanied David Sarnoff, vice-president and general manager of the Radio Corporation of America, to Europe in 1924 to investigate the progress which had been made both in England and on the Continent in all fields of radio. Mr. Baker is a member of the American Institute of Electrical Engineers, the Institute of Radio Engineers and the National Electrical Manufacturers' Association.

JOHN J. ALBRIGHT, JR., formerly district manager of the Niagara, Lockport & Ontario Power Company, at Olean, has been transferred in a similar capacity to Syracuse.

O. W. BENNETT, assistant treasurer for the Blackstone Valley Gas & Electric Company at Pawtucket, R. I., for the last four years, has been made assistant comptroller of the Puget Sound Power Company, Seattle. Mr. Bennett will be succeeded at Pawtucket by JOHN W. KELLY, now assistant treasurer of the Baton Rouge (La.) Electric Company.

C. P. BILLINGS, after nine years' service in various capacities with the West Penn System of Pittsburgh, has resigned and joined the staff of the Electric Bond & Share Company at New York. Mr. Billings had served as vice-president and general manager of the Wheeling Traction Company, vice-president of the West Penn Company and vice-president of the West Virginia Power & Transmission Company.

DR. E. F. W. ALEXANDERSON, consulting engineer of the General Electric Company, was made the recipient of the John Ericsson medal by the American Society of Swedish Engineers for his outstanding contributions to the field of electrical engineering. The presentation was made Feb. 11 at a dinner which marked the fortieth anniversary of the Swedish Engineers' Society. Dr. Alexanderson, who recently demonstrated his developments in radio television, made a short address in which he commended the General Electric Company for providing the facilities and laboratories which have made his research work possible.

CYRUS S. EATON, chairman of the board of directors of the United Light & Power Company, was recently elected a director of the Sherwin-Williams Company. For some years Mr. Eaton has been a prominent figure in the electrical industry, having entered the public utility field in the United States in its early stages, though a Canadian by birth. While still in his twenties, he organized and financed public utility properties in Ohio, forming the Continental Gas & Electric Corporation, of which he soon became chairman. Making his headquarters in Cleveland, Ohio, he extended the field of operation of the Continental company until in 1925 it was merged with the United Light & Power Company. In addition to holding the chairmanship of the board of the United Light & Power Company.

Mr. Eaton is also on the directorate of several other utility companies and industrial organizations.

R. T. PORTER, formerly district superintendent of the Alabama Power Company at Decatur, is now identified with the Georgia Power Company.

E. C. SORBY, commercial manager of the Wisconsin Power & Light Company, Beloit, Wis., for the past two years, has joined the George D. Roper Corporation, Rockford, Ill.

WENDALL P. HOLMAN of Monticello, N. Y., has been appointed educational director of the Rockland Light & Power Company, the Rockland Electric Company and the Pike County Light & Power Company.

GEORGE BARTHOLOMEW, formerly connected with the Niagara, Lockport & Ontario Power Company at Cuba, N. Y., has been transferred to Olean in the capacity of commercial manager.

M. E. HALL has left Lancaster, Wis., for Decorah, Iowa, where he takes charge of Interstate Power Company interests for a wide territory. His place at Lancaster is taken by CHARLES MEYERS of Bloomington.

J. E. GARGRAVE has been appointed manager of the Otter Tail Power Company at Aneta, N. D.

RICHARD VAN HORN, an electrical engineer of the General Electric Company at New Haven, Conn., has been appointed engineer of the United Illuminating Company at Bridgeport and will assume his new duties March 1.

P. H. POWERS, manager of the Keystone division of the West Penn Power Company, Pittsburgh, has been appointed commercial manager, effective March 1, in which capacity he will have charge of all activities of the commercial department. H. F. SMIDDY will on the same date become an assistant commercial manager. K. G. FULLER will succeed Mr. Powers as manager of the Keystone division about Feb. 15.

WILLIAM G. KEAY, formerly New England sales manager of the Eureka Vacuum Cleaner Company and more recently sales representative of the Premier Vacuum Cleaner Company in the same territory, has been appointed merchandising manager of the Associated Gas & Electric Company properties in New England, with headquarters at Cambridge, Mass.

FREDERICK W. BRIERLY, superintendent of the Bridgeport (Conn.) division of the United Illuminating Company for 36 years, has tendered his resignation, effective July 1, and will be succeeded by WALTER A. UPHAM, at present assistant superintendent. Mr. Brierly plans a long vacation in California. He has been associated with the electrical industry for 50 years, going to Bridgeport from the Union Electric Company, Worcester. He designed the Steelpoint station at the foot of East Main Street, Bridgeport, which was put in operation last year, and substations at Bridgeport, Fairfield and Milford. Mr. Upham was with the Pennsylvania Edison Company at Easton, Pa., before going to Bridgeport and is a graduate of Norwich University.

M. DeMerit Named Assistant to President

Merrill DeMerit, distribution manager of the West Penn Power Company since December, 1926, has been appointed assistant to the president of that company. Mr. DeMerit affiliated himself with the West Penn Power organization in 1922 and he served until 1926 in the capacity of distribution engineer. In the course of his engineering career he has always devoted special attention to distribution and the knowledge obtained he used in revamping the West Penn Power Company's distribution system.

Mr. DeMerit was connected with the distribution engineering department of the Detroit Edison Company before transferring his interests to Pittsburgh.

MERRILL DEMERIT

A graduate of the University of Wisconsin, he entered the General Electric Company test course and subsequently affiliated himself with the Wagner Electric Company, St. Louis, engaging in meter manufacturing and inspection. Mr. DeMerit is active in association work, being a member of the overhead systems committee of the National Electric Light Association and of the Pennsylvania Electrical Association.

HAROLD R. WALDRON has been made district manager of the Niagara, Lockport & Ontario Power Company in the Chautauqua division; JOSEPH H. MILBYER, superintendent; J. A. PARKER, assistant superintendent, and FRANK W. BULLOCK, commercial manager.

S. H. OSTERHOUDT, formerly superintendent of the Associated Gas & Electric interests at Liberty, N. Y., has been transferred to the Harlem Valley territory as superintendent of the Brewster district.

JOHN P. HANNON, who has been with the Connecticut Light & Power Company for 21 years, has been appointed manager of the Branford (Conn.) district. Mr. Hannon started as a meter reader in 1907 and obtained his technical education through night study. In 1921 he became head of the test department at Waterbury and soon after was engineer and assistant manager at New Britain, and later division engineer.

C. E. STEPHENS, Northeastern sales manager of the Westinghouse Electric & Manufacturing Company, has been elected president of the New York chapter of the company's Veteran Employees' Association. The association is composed of employees in all parts of the country who have been with the company twenty years or more.

FLOYD F. MCCAMMON, for the last eleven years manager of power sales of the Public Service Company of Colorado, Denver, has been appointed assistant general superintendent of the company, effective Feb. 1. Mr. McCammon, a bachelor of science in electrical engineering, has been associated with Public Service Company since his graduation from Colorado College in 1916. It was at that time that he entered the company as junior engineer. Later he served in the United States Navy as ensign in the engineering division, and upon his return to Denver in July, 1919, he again became associated with the company as general engineer. In August, 1920, he was appointed power sales engineer, which position he held until his recent promotion.

D. F. MINER has recently been appointed manager of the material and process engineering department of the Westinghouse Electric & Manufacturing Company. Mr. Miner was first employed by the company in 1919 as an assistant to the section engineer of the electrical section. Since 1920 he has served as section engineer of the experimental section of the material and process engineering department. Mr. Miner was born at Hazarville, Conn., in 1892 and is a graduate of Clark College, Worcester, Mass. He is a member of the American Institute of Electrical Engineers and has spoken before that body and other engineering groups on the subject of high-voltage tests, in which he has utilized voltages of 1,000,000.

PROF. J. A. FLEMING, honorary member of the Institution of Electrical Engineers of Great Britain, has been selected by that society as the seventh recipient of the Faraday medal, which is awarded by the council of the institution not more frequently than once a year, either for notable scientific or industrial achievement in electrical engineering or for conspicuous services rendered to the advancement of electrical science, without restriction as regards nationality, country of residence or membership of the institution. Professor Fleming, who is well known as the inventor of an early radio tube, was professor of electrical engineering in the University of London from 1910 until his retirement in 1927 and has played a notable part in the development of a great many applications of electrical science.

Financial and Statistical News

Merger of New York Utilities Again Rumored Imminent

THE growth of banking influence in the utility field is expected to culminate shortly in the amalgamation of the public utilities of the New York area into the nation's second largest utility group. While official denial is given the rumor, the usual orgy of premature press reports insist that prolonged attempts to consolidate these properties are approaching fruition. It is beyond question that the stock market has been discounting some such merger for many months.

The properties that would naturally be involved are the Consolidated Gas System, Brooklyn Edison Company, Brooklyn Union Gas and Brooklyn Borough Gas Company. Rumor includes also the Long Island Lighting Company, Kings County Lighting Company and the Westchester County utilities. This group, in the aggregate, has assets of well over $1,000,000,000 and provides practically exclusive gas and electric service to an area including and extending well beyond the metropolitan area of Greater New York.

Recent acquisition by the Mellon interests of fairly large blocks of the stock of Consolidated Gas and Brooklyn Union Gas suggest that this powerful banking group will figure prominently in any agreement arrived at. It is rumored, moreover, that holdings of the Nicholas A. Brady group in Consolidated Gas and Brooklyn Edison have recently passed into the hands of interests affiliated with the Mellon and Morgan banking groups.

One feature of the suggested negotiations, details of which those interested naturally withhold until arrangements have been completed, is the logic of such a merger. The benefits of large scale consolidation in the utility field are amply demonstrated, and the fact that the proposed tie-up is of such enormous proportions follows inevitably from the fact that the area served is the world's largest metropolitan area. Furthermore, the trend in the New York area is certainly toward unified control of interborough affairs.

Japanese Company Offers New Issue

First mortgage 6½ per cent gold bonds of the Nippon Electric Power Company, Ltd., were recently offered the investing public to the amount of $9,000,000, the price being 94 and interest, yielding more than 7 per cent. These bonds, dated Jan. 2, 1928, mature Jan. 1, 1953. The Nippon Electric Power Company is at present primarily a wholesaler of power, its principal customers being the Toho Electric Power Company; the Great Consolidated Electric Power Company; the Kyoto Electric Light Company; the Hokurliku Co-operative Electric Company, and the Osaka Municipal Electric Bureau.

Customers Oversubscribe Stock Before Campaign

THE entire issue of 6 per cent preferred stock, series C, offered by the Rockville-Willimantic Lighting Company, Willimantic, Conn., to its customers, through its employees, was oversubscribed on Feb. 7, the day preceding that on which the company's customer-ownership campaign was officially scheduled to open.

The enthusiasm which was aroused among the employees at the educational and sales meetings which preceded the campaign and the gratifying response of the company's customers to the offering were responsible for the early oversubscription of the issue. The plan used in preparing for the campaign was furnished by P. H. Whiting & Company, Inc., New York, and representatives of that organization, in co-operation with the executives of the Rockford-Willimantic Lighting Company, conducted the educational and sales meetings and directed the employees' efforts in the early stages of the campaign.

St. John River Power Increases Capital

Notice recently appeared in the government *Gazette* of the granting of supplementary letters patent, under the New Brunswick companies' act of 1916, to the St. John River Power Company, authorizing an increase in capitalization by the issue of $601,750 of preferred stock. The St. John River Power Company is a wholly owned subsidiary of the International Paper Company, formed for carrying on the hydro development at Grand Falls on the St. John River in New Brunswick.

GENERAL PUBLIC SERVICE INCREASES DIRECTORATE.—The following directors have been elected by the General Public Service Corporation, increasing the board membership from eleven to seventeen: Gordon H. Balch; C. E. Groesbeck, executive vice-president of the Electric Bond & Share Company; Edwin Gruhl, vice-president and general manager of the North American Company; Philip G. Mumford, president of the Commercial Solvents Corporation; Sigourney B. Olney, member of the law firm of Cullen & Dykman, and Thomas W. Streeter, chairman of the board of the Simms Petroleum Company.

Cleveland Electric Net Up 10 Per Cent

An increased volume of business during 1927 allowed the Cleveland Electric Illuminating Company to show gross operating revenues for the year of $23,609,479, which is an increase of 7.1 per cent over 1926. Operating expenses were $12,257,458, a 4.7 per cent increase. This allowed for an advance of approximately 10 per cent in net operating revenues, which were $11,352,021 last year.

	Twelve-Month Period Ended Dec. 31, 1927	Dec. 31, 1926
Gross earnings	$23,609,479	$22,048,267
Operating expenses	12,257,458	11,704,563
Net operating revenues	11,352,021	10,343,704
Non-operating revenues	540,411	490,185
Gross income	$11,892,432	$10,833,889
Deductions		
Interest	2,360,286	1,766,993
Taxes	3,006,000	2,739,000
Amortization of discount on debt	90,872	88,948
Sinking fund requirements	242,875	242,874
Total deductions	5,700,034	4,837,817
Net income	6,192,398	5,996,072

The company's maximum load for the year 1927 was 293,731 kw., an increase of 2.3 per cent over the maximum load for 1926. The year's operation showed 1,174,676,925 kw.-hr. generated, which is a 5.1 per cent increase over 1926. The total number of consumers at the end of 1927 was 282,441, an increase of 3.6 per cent during the year. There were 158 new industrial and commercial consumers, each having a load in excess of 25 kw.

A statement of the company's earnings in comparison with those of 1926 is given in the accompanying table.

PUGET SOUND COMPANY TO ISSUE STOCK.—The Puget Sound Power & Light Company has filed with the Massachusetts Commissioner of Corporations a notice of the issuance of 20,000 shares of no par preferred stock. Payments on the shares are to be made as follows: 5,000 shares at not less than $91 a share, 5,000 shares at not less than $92 a share, 5,000 shares at not less than $93 a share and 5,000 shares 1,174,676,926 kw.-hr. generated, which

MONTREAL LIGHT REPORT SHOWS RECORD EARNINGS FIGURE.—Montreal Light, Heat & Power Consolidated

continued to make new earnings records in 1927, according to the annual report recently issued. Despite a marked increase in fixed charges, net income was well maintained, while one of the outstanding features of the report was a $6,000,000 increase in working capital position. The profit and loss account shows gross revenue amounting to $20,314,902, the highest figure yet reported, as compared with $18,907,382 in 1926. Operating expenses were $7,280,697, as against $7,109,819; taxes, $1,186,707, compared with $1,213,038, and depreciation, $2,031,490, compared with $1,890,738, leaving net revenue $9,816,006, an increase of practically $1,200,000.

EDISON COMPANY TO EXCHANGE STOCK. — The Southern California Edison Company, which is planning to purchase 2,000 shares of the common stock of the Ojai Power Company of Ventura County, proposes to give six shares of its series C 5½ per cent preferred stock for each share of the Ojai company stock.

Brooklyn Edison Net Income Shows 10 Per Cent Rise

WHILE the annual report of the Brooklyn Edison Company, just issued, shows an extremely gratifying growth over the previous year, this growth is not so great as was the 1926 increase over 1925. Gross revenue increased 9 per cent, against an increase of 15 for the previous year. Net revenue increased 9 per cent over 1926, while the 1926 increase over 1925 was 18 per cent and the balance transferred to surplus showed a 9 per cent increase over the previous year, against 20 per cent the year before. These reductions are more or less indicative of industry conditions. They are not due to any great expansion in operating costs, since expenses, including taxes, maintenance and retirements, increased but 9 per cent over 1926, against the 13 per cent increase of that year over 1925. The fact, however, must be taken into account that the company made a voluntary reduction in the maximum rate for service from 7½ cents to 7 cents per kilowatt-hour, which resulted in a saving of about $1,400,000 to consumers during the year. This was the second general reduction in rates that has occurred in two years, and the two reductions together effected a total saving of more than $2,500,000.

The position of the company's surplus account indicates the exceedingly strong financial standing which has been achieved. Last year $2,167,132 was transferred to surplus, making a net increase in surplus of $2,440,934. Even with this increase earnings on common stock amounted to well over $11 a share, approximately the same as the amount earned in 1926, but the capital stock of the company was increased during the year from 750,000 to 1,000,000 shares at $100 par.

The company continues to pay 8 per cent on the common stock. The shareholders were invited to subscribe to

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Feb. 14	Low 1927	High 1927
ABITIBI PWR. & PAPER, 4% com.—no par	*k*151	140½*	163½*
Ala. Pwr., $7 com. pf.—no par	114½	107	115
Allis Chalmers Mfg.,6% com.	122	115½*	125*
Aluminum Co. of Amer., com.	136	120¼	136*
Aluminum Co. of Amer., 6% pf.	106½	105½*	107½*
Amer. & Foreign Pwr., 7% pf.—no par	*k*107½	105½*	108½*
Amer. & Foreign Pwr., com.—no par	24½	22½*	27½*
Amer. Bosch Magneto, com.—no par	18½	17 *	22½*
Amer. Brown Boveri Elec.†	17	14½*	18*
Amer. Brown Boveri Elec., pf. $7	62½	55*	63*
Amer. Gas & Elec., 6% pf.—no par	107½	106½*	109*
Amer. Gas & Elec., com. †—no par	123½	117½*	126½*
Amer. Lt. & Trac., 6% pf.	118	115½*	115½*
Amer. Lt. & Trac., new com.	181	170*	191*
Amer. Pwr. & Lt., 6% pf.	105½	104½*	109½*
Amer. Pwr. & Lt., com. †—no par	66½	62*	69½*
Amer. Pub. Serv., 7% pf.	*a*100	99*	100*
Amer. Pub. Serv., com. †	*k* 70	65	75
Amer. Pub. Utilities, 7% ptc. pf.	92	73	90
Amer. Pub. Utilities, 7% pr. pf.	97	88	97
Amer. Pub. Utilities, com.	*k* 60	58	70
Amer. States Sec., A	5	2½	5½
Amer. States Sec., B	5½	2½	5½
Amer. Superpwr., 6% ptc pf.—25	29½	28½*	29½*
Amer. Superpwr., 6% 1st pf.	*l* 102½	....	....
Amer. Superpwr., Class A†—no par	41½	37*	41½*
Amer. Superpwr., Class B†—no par	43	37½*	43*
Amer. Wtr. Wks. & Elec., 6% pf.	104½	101½*	104½*
Amer. W.W. & E., com. new—no par	58	54½*	61*
Anaconda Copper cap. $3	59	53½*	59½*
Appalachian Electric Pwr., 7% pf.	109	100	109
Arkansas Pwr., & Lt. 7% pf	107½	101	108
Assoc. Gas & Elec., $3.50—50	54	....	....
Assoc. Gas & Elec., pf.—$6—no par	95	85	98
Assoc. G. & E., Class A, 10—no par	47½	47½*	51½*
BABCOCK & WILCOX, 7% com.	121½	120*	124½*
Binghamton L., H. & P., $6 pf.	105	93	103½
Birmingham Elec., pf.—$7—no par	109	105	111½
Blackstone Valley G. & E., 6% pf.	*k*107	105	110
Blackstone Valley Gas & Elec., 10% com.—50	132	132*	135½*
Blaw-Knox, com.†	*i* 104½	91*	105*
Brazilian Trac., Lt. & Pwr., $7 com.	*f*209½	....	....
Brazilian Trac., Lt. & Pwr.,com.,new	*f* 53½	....	....
Broad River Pwr., 7% pf.	105½	97	105½
Brooklyn Edison, 8% com.	234½	206½*	235½*
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	*l* 26½	....	....
Buffalo, Niagara & East. Pwr. com. $1.20—no par	*l* 35½	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	*k* 99	96	104½
California Ry. & Pwr., 7% pf.	*k*135	125	150
Carolina Pwr. & Lt., pf.—$7—no par	*l*110½	109*	110½*
Central & S. W. Util., $7 pf.—no par	*a*102½	99½*	105½*
Central & S. W. Util., pr. in. $7 pf.—no par	*a*105	104½*	108*
Central Ark. Ry. & Lt., 7% pf.	104	100	107
Central Ill. Pub. Serv., $6 pf.	*a* 99	97½*	98½*
Central Ind. Pwr., 7% pf.	*a* 97½	95*	97½*
Central Maine Power, 6% pf.	95	....	....
Central Maine Power, 7%	107	102	110
Central Pwr. & Lt., 7% pf.	105	100½	105
Central States Elec., 7% pf.	106	104½*	107½*
Century Elec., 6% com.	*b*141	140*	145*
Chicago Fuse Mfg., com.—$2.50 no par	*a* 30	30*	33½*
Cincinnati Gas & Elec., 5% com.	*g* 99	98½*	100*
Cities Service, $6 pf.—no par	*l* 95½	87*	94½*
Cities Service, pf. B—no par	*l* 9	8*	8½*
Cities Service, pf. BB—no par	*l* 90	80½*	86*
Cities Service, com.—20	*j*55½	40½*	58½*
Cities Service, Bks. Shrs.—10	*l* 27½	22½*	27 *
Cities Service Pwr. & Lt., 7% pf.	106½	105½*	106½*
Cities Service Pwr. & Lt., 6% pf.	96½	95½*	96½*
Cleveland Elec. Illg., 6% pf.	114	108	114
Cleveland Elec. Illg., 10% com.	360	285	370
Columbia Gas & Elec., 6% pf.	*k*107½	107½*	110½*
Columbia G. & E. com. $5—no par	93	89½*	97½*
Columbus Elec. & Pwr., $2 com.—no par	*m* 65	....	....
Columbus Elec. & Pwr., 7% pf.	112	....	....
Columbus Ry., Pwr.&Lt., 6% 1st pf.	105	98½	108½
Columbus Ry., Pwr. & Lt., 7 %pf. B	107½	96	106
Columbus Ry., P.& L t. com.—no par	*k*105	75	110
Commonwealth Edison, 8% com.	*a*180	165*	189*
Commonwealth Pwr., 6% pf.	103	102½*	104½*
Commonw'th Pwr., $2, com.—no par	66½	62½*	69*
Conn. Lt. & Pwr., 8% pf.	121	119	123
Conn. Lt. & Pwr., 7% pf.	117	112	119
Cons. Gas of N. Y., pf.	101½	101½*	102½*
Cons. Gas of N. Y., com. $5—no par.	136½	119½*	139½*
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	*e*112½	110½*	113*
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	*e*110½	110½*	113*
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	*e*110½	110½*	115*
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	*e*125½	125½*	128½*
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $3.00—no par	*e* 72	67½*	72½*
Consolidated Pwr. & Lt., 7% pf.	105	100	106
Consumers Pwr., 6% pf.	104½	100	106½
Consumers Pwr., 6.6% pf.	106½	103	107½
Continental Gas & Elec., 7% pr. pf.	107½	100	107½
Contl. G. & E. com. $4.40—no par.	*k*230	210	265
Crocker Wheeler, com.†	30	23	38
Crocker Wheeler, 7% pf.	90	78	88
DALLAS PWR. & LT., 7% pf.	110½	107	111½
Dayton Pwr. & Lt., 6% pf.	108½	101	109½
Detroit Edison, 8% com.	180½	166½*	194½*
Dubilier Condenser, com.—no par	3	2½*	3½*
Duke Pwr., cap.	135	135*	145*
Duquesne Lt., 7% pf.	*k*116½	115½*	116½*
EASTERN NEW YORK UTIL., $7 pf.	*k*110½	102	112½
Eastern New York Util. com.	*k* 65	70	75
Eastern States Pwr. $7, com.	13½	11½*	15½*
Eastern States Pwr., pf.	97	90	99
East. Tex. Elec., 7% pf.	108	106	109
Edison Elec.of Boston, $12 com.	*d*265	259	268
El Paso Elec. 7% pf.	110½	105	112½
Elec. Bond & Share, 6% pf.	*l*109½	109½*	111½*
Elec. Bd. & Sh. Sec., com. $1—no par	*l* 91	76*	80½*
Electric Household Util.†	*a* 14½	13½*	15½*
Elec. Investors, 6% pf.—no par.	102	92	101
Elec. Investors, com.†—no par.	43½	40½*	45½*
Elec. Pwr. & Lt., ctfs. pf.	107½	106½*	108½*
Elec. Pwr. & Lt., ctfs., 40% pd.	*k*123	120½*	123½*
Elec. Pwr. & Lt., ctfs., com.—no par	33½	28½*	34½*
Elec. Refrig. cap.†	14½	11½*	14½*
Elec. Ry. Securities, com.—no par	6½	....	....
Elec. St. Battery com. $5.25—no par	70½	69½*	75½*
Elmira Wtr., Lt. & R.R., 7% pf.	*k*105	99	105½
Empire Pwr., ptc.†	*k* 32½	32½*	35½*
Engr. Pub. Serv. $7, pf.—no par	108½	107½	109*
Engr. Pub. Serv., com.—no par	35	34*	36½*
Eureka Vacuum Cleaner, com. $4—no par	72	72*	79*
FAIRBANKS MORSE, 7% pf.	*k*107	104*	106½*
F.-M., com.—$3—no par	*k* 37½	32½*	40½*
Federal Lt. & Trac., com $1.40	51½	42*	55*
Federal Lt. & Trac., $6 pf.—no par	*k* 101	98*	105*
Florida Pwr. & Lt., 7% pf.	107½	104½*	107½*
Ft. Worth Pwr. & Lt., 7% pf.	*l*113½	113*	114½*
GALVESTON-HOUSTON ELEC. 6% pf.	76	68	85
Galveston-Houston Elec., com.	32	26	32
General Cable, Cl. A $1 no par.	*m*57½	56½*	60*
Gen. Elec. $3 com.—no par.	131	127½*	138½*
Gen. Elec., special—6%	11½	11½*	11½*
Gen. Gas & Elec. (Del.) com A $1.50—no par	37	35½*	39½*
Gen. G. & E. (Del.) pf. A $8—no par	*k*125	123*	126½*
Gen. G. & E. (Del.) pf. A $7—no par.	*k*111½	108½*	112*
Gen. G. & E. (Del.) pf. B $7.	*k*106½	105½*	107*
Gen. Pub. Serv., $7 cum. pf., no par.	*k*110	102	112
Gen. Pub. Serv., com., no par.	*k* 18½	16½*	20½*
Ga. Lt., Pwr. & Rys., com.	*k* 59	50	70
Ga. Ry. & Pwr., 8% pf.	*k*125	119	125
Ga. Ry. & Pwr., 7% pf.	*k*113½	106	115
Gt. Western Pwr., 7% pf.	*h*105	....	....
IDAHO PWR., 7% pf.	108½	103	110
Ill. No. Utilities, 6% pf.	*a* 99	98½*	99*
Ill. Pwr. & Lt., 7% pf.	104½	99	104*
Ingersoll Rand com.	91½	91*	94*
Int. Combus. Engr., com. $2—no par	51½	49*	55½*
Int. Combustion Engr.,7% pf.	*k*103½	104½*	105½*
Int. Util., Class A—$3.50—no par.	47½	46*	51 *
Int. Utilities, Class B—no par.	8½	8*	*10 *
Interstate Pwr., pf.—$7—no par.	100	93	100
Interstate Pub. Serv., 7% pf.	102	98	104
Iowa Ry. & Lt., 7% pf.	*k*100	97	100
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	106½	97½	108
Johns-Manville. com.†—no par.	124½	120½*	125*

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f* Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, Feb. 11. *l*Bid price Wednesday, Feb. 15. *m*Latest quotations available. †Dividend rate variable. *1928

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Feb. 14	Low 1927	High 1927
KANSAS CITY PWR. & LT. pf. $7	115¼	115*	115¼*
Kansas Gas & Elec., 7% pf.	*l*109¼	107*	109*
Kentucky Hydro-Elec., 7% pf.	*a*104	102*	104*
Kentucky Sec., 6% pf.	92	83	90
Kentucky Sec., 6% com.	140	100	135
Kentucky Utilities, 6% pf.	*k*101¼	95	101¼
LACLEDE GAS LT., 12% com.	*k*230	200*	260*
Lehigh Pwr. Sec., com.—no par	25¼	19¼*	27¼*
Long Island Ltg., 7% pf.	112	107	112¼
Long Island Ltg., com.†—no par	*k*170	139	180
Los Angeles Gas & Elec., 6% pf.	108	98	105
Louisville Gas & Elec., cl. A. $1.75	29¼	28*	29¼*
MAN. ELEC. SUPPLY, cap. $5—no par	50¼	50*	54¼*
Manilla Elec., com.†—no par	*k* 43¼	45¼*	50*
Maytag Mfg., com.50—no par, ex div.	32	32¼*	34¼*
Memphis P. & L., pf.—$7—no par	*k*109¼	107	111
Metropolitan Ed., pf.—$6—no par	106¼	93	106
Metropolitan Ed., pf.—$7—no par	109	104	110
Metropolitan Ed., com. $5—no par	*k*145	60	72
Middle West Utilities, 7% pf.	*a*124½	116¼*	124¼*
Middle West Util., 7% pr. lien	*a*128	125¼*	129¼*
Middle West Util., com. $6—no par	*a*132	123¼*	135*
Midland Utilities, pr. ln. 7% pf.	*a*105¼	105*	106¼*
Midland Utilities, 7% pf. A	*a*104¼	103*	104¼*
Milwaukee Elec. Ry. & Lt., 7% pf.	*k*103	100	103
Milwaukee Elec. Ry. & Lt., 6% pf.	*k* 99	98	101¼
Minn. Pwr. & Lt., 7% pf.	*l*109	107*	109*
Miss. River Pwr., 6% pf.	108	94	108
Miss. River Pwr., 3% com.	*m* 62	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	*k*108	100	109
Mohawk Hudson Pwr., 2d pf.—$7—no par	106¼	106¼*	110*
Mohawk Hudson Pwr., com.—no par	30¼	29¼*	31¼*
Montana Pwr., 5% com.	158¼	102¼*	165¼*
Montreal Pwr., 7% com.	*f* 92¼	....	....
Mountain States Pwr., 7% pf.	*k*103	97	103
Mountain States Pwr., com.†	16	....	....
NASSAU & SUFFOLK LTG., 7% pf.	109	98	110
National Carbon, 8% pf.	*m*138½	138*	139*
National Elec. Pwr., A†	*a* 32	27¼*	32¼*
National Lt., Ht. & Pwr., com.	*k* 24	20	30
National, Light, Ht. & Pwr., 5% pf.	*k* 72	70	80
National Pwr. & Lt., pf.—$7—no par	110¼	108¼*	111*
National Pwr. & Lt., com.†—no par, ex. div.	25¼	21¼*	27¼*
National Pub. Serv., 7% pf.	100	93	102
National Pub. Serv., 7% ptc., pf.	114	108	115
National Pub. Serv., A com. $1.60—no par	26¼	22*	27¼*
National Pub. Serv., B com.—no par	28¼	24¼*	30*
Nebraska Pwr., 7% pf., ex. div.	*l*110	110*	111¼*
Nevada-Calif. Elec., com.	*k* 33	22	37
New Brunswick Pwr., 4% pf.	*k* 60	60	70
New Eng. Pub. Serv., pr. ln. pf. $7	*k*109	98¼	104
New Eng. Pub. Serv., pf. $7	*k*108	95	100
New Orleans Pub. Serv.—7% pf.	108¼	103	110
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	100	91	100
N. Y. Central Elec., 7% pf.	*k*103	101	104
New York Power & Light 8% pf.	114	....	....
New York Power & Light, 7% pf.	114¼	....	....
Newport News & Hampton Ry., Gas & Elec., 5% com.	*k*109	110	115
Newport News & Hampton Ry., Gas & Elec., 7% pf.	*k*109	110	115
Niagara Falls Pwr., 7% pf.—25	28¼	28*	28¼*
No. Amer., 6% pf.—50	54¼	53¼*	54¼*
No. Amer., com., no par	61¼	58¼*	62¼*
No. Amer. Edison, $6 pf.—no par	104¼	103¼*	105¼*
No. Caro. Pub. Serv., pf.—$7—no par	110	93	105
Northeastern Pwr., com.	20¼	19¼*	23 *
No. N. Y. Utilities, 7% pf.	107	103	109
No. Ohio Pwr., com.—no par	22¼	18*	24¼*
No. Ont. Lt. & Pwr., 6% pf.	*k* 98	98*	98¼*
No. Ont. Lt. & Pwr., 4% com.	*k* 72	73	78
No. States Pwr. (Del.), 7% pf.	*k*109	108¼*	109¼*
No. States Pwr. (Del.), 8% com.	134	123*	136¼*
No. Texas Elec., 6% pf.	50	45	70
No. Texas Elec., com.	17¼	5	36
OHIO BRASS, com. B $4—no par.	98	89*	98¼*
Ohio Brass, 6% pf.	*k*107	100	111
Ohio Pwr., 6% pf.	*k*106	96	106
Ohio Pub. Serv., $6 pf.	103	95	102
Ohio Pub. Serv., 7% pf.	110¼	103	111
Ohio River Edison, 7% pf.	109	103	109¼
Oklahoma Gas & Elec., 7% pf.	111¼	....	....
PACIFIC Gas & ELEC., 6% pf.	27¼	26¼*	27¼*
Pacific Gas & Elec., 8% new com.	48¼	47¼*	49¼*
Pacific Pwr. & Lt., 7% pf.	*l*108¼	106*	108¼*
Penn Cent. Lt. & Pwr., $5 pf.—no par	*c* 79¼	77¼*	79¼*
Penn-Ohio Edison, 6% pf. no par	94¼	94*	96*
Penn-Ohio Edison, 7% pf.	108¼	107*	109*
Penn-Ohio Pwr. & Lt., 7% pf.	109¼	99	110
Penn Pwr. & Lt.—$7—no par	*l*110¼	109¼*	110¼*
Penn Wtr. & Pwr., $2.50 com., new	*e* 70¼	68*	72¼*
Phila. Co., 5% pf.—50	*k* 45¼	46¼*	48¼*
Phila. Co., 6% pf.—50	52¼	52*	53*
Phila. Co., com.—50	*k*150	149¼*	163*
Phila. Elec., 8% com.—25	*c* 59	55¼*	58¼*
Portland Elec. Pwr., 7% pf.	103¼	97¼	102¼
Portland Elec. Pwr., 6% pf.	92	78	84
Portland Elec. Pwr., 6% 2d pf.	85	55	70
Portland Elec. Pwr., com.	50¼	42½*	50¼*
Potomac Elec. Power, pf.	*k*111	110	111¼
Pwr. Sec., pf.—no par	*k* 60	28	60
Pwr. Sec., com.—no par	*k* 12	5	15
Public Serv. of Colorado, 7% pf.,	108	99*	103*
Pub. Serv. of N. J., 6% pf.	106	103¼*	106¼*
Pub. Serv. of N. J., 7% pf.	*k*119	118*	120¼*
Pub. Serv. of N. J., $2 com.—no par	43¼	41¼*	45*
Pub. Serv. of No. Ill., 6% pf.	*a*111	110¼*	113¼*
Pub. Serv. of No. Ill., 7% pf.	*a*119	....	....
P. S. of No. Ill., com. $8—no par	*a*168	159¼*	180*
Pub. Serv. of No. Ill., $8 com.	*a*173	159¼*	180*
Pub. Serv. of Okla., 7% pr. ln.	*k*103	90	103
Pub. Serv. Elec. & Gas, 6% pf.	*k*109¼	109*	110¼*
Puget Sound Pwr. & Lt., 7% pf.	*k*111	109¼*	112*
Puget Sound Pwr. & Lt., $6 pf.—no par	98¼	92*	98¼*
Puget Sound Pwr. & Lt., com.	45	34¼*	46¼*
RADIO COPR. OF AMER., $3.50 pf.—50	*k* 96¼	54¼*	57¼*
Radio Corp. of Amer., com.—no par	95¼	88¼*	104¼*
Rhode Island Public Service, pf. $2—no par	*k* 31¼	30¼*	31¼*
Rochester Gas & Elec. 6% pf. D	*k*105¼	101	103¼
Rochester Gas & Elec., 7% pf. B	107	105	107
Rochester Gas & Elec., 7% pf. C	105¼	101¼	103¼
SAN. JOAQUIN Lt. & Pwr., 7% pr. pf.	*k*111	105	112¼
St. Joseph Ry., L., H. & P., 5% pf.	*k* 75	70	75
Servel Corp.	6¼	4¼*	7¼*
Sierra Pacific Elec., 2% com.	38¼	29*	38¼*
Sioux City Gas & Elec., 7% pf.	107	99	105¼
Southeastern Pwr. & Lt., pf.—$7 no par	*l*108¼	....	....
Southeastern Pwr. & Lt., ptc. pf.	*l* 66	....	....
Southeastern Pwr. & Lt., com.—no par	43	42*	44¼*
So. Calif. Edison, 8% pf.	*k* 45	36¼	40
So. Calif. Edison, 7% pf.	28¼	28¼*	28¼*
So. Calif. Edison, 6% pf.	*k* 26¼	25¼*	27¼*
So. Calif. Edison, 8% com.	46¼	43¼*	47¼*
Southern Cities Utilities, 7% pf.	*k* 75	67	90¼
Southwestern Lt. & Pwr., A $3.	70	60	65
Southwestern Lt. & Pwr., B	65	60	65
Southwestern Lt. & Pwr., $6 pf.	92	83	91¼
Southwestern Pwr. & Lt., 7% pf.	*k*111	110*	111¼*
Standard Gas & Elec., 8% pf.	66¼	65*	67¼*
Standard Gas & Elec., 7% pr. pf.	111	103	113
Standard G. & E., com. $3.50	62¼	57¼*	65*
Standard Power & Light, com.	36¼	29¼*	37¼*
Standard Pwr. & Lt., 7% pf.	*k*104	103¼*	105*
Staten Island Edison, pf.—$6—no par	102¼	99	103
Superheater, $6 com.—no par	170	164*	178*
Syracuse Lighting, 7% pf.	*k*110	103	111
Syracuse Lighting, 8% pf.	*k*117¼	114	119
TAMPA ELEC., com. $2	62	62*	64*
Tenn. Elec. Pwr., 6% pf.	103	92	103
Tenn. Elec. Pwr., 7% pf.	109¼	103	110
Terre Haute, Ind. & East. Trac., 5% pf.	*k* 15	20	30
Terre Haute, Ind. & East. Trac., com.	*k* 1	1	3
Tex. Pwr. & Lt., 7% pf.	*l*113¼	113¼*	115*
Tide Water Pwr., 8% pf.	111¼	105	111
Timken Roller Bear., com.—$4 no par	123¼	121¼*	134*
Toledo Edison, 7% pf.	109	102*	107*
Toledo Edison, 6% pf.	*k*103	95	105
Toledo Edison, 6% com.	*k*100	93	102
Tri-City Ry. & Lt., 6% pf.	*k*100	96	99
UNITED GAS & ELEC., 6% pf.	100¼	98	103
United Gas & Elec. (N. J.), 5% pf.	75	70	77
United Gas Impr., 8% com.—50	*c*116¼	111¼*	117¼*
United Lt. & Pwr., pf.—$4—no par.	*k* 55	53*	55*
United Lt. & Pwr., pf.—$6.50—no par	*a* 99	....	....
United L. & P., com. A .48—no par.	*a* 16¼	14*	17¼*
United L. & P., com. B .48—no par.	*k* 18	19*	20*
Utah Pwr. & Lt., 7% pf.	*i* 112	109¼*	111*
Utica Gas & Elec., 7% pf.	103	105	106¼
Utica Gas & Elec., 8% com.	*k*200	215	225
Utilities Pwr. & Lt., 7% pf.	100	93	100
Utilities Pwr. & Lt., com. A $2	*s*9¼	28¼*	30¼*
Utilities Pwr. & Lt., com. B $1—no par	20¼	18¼*	21*
VERMONT HYDRO-ELEC., 7% pf.	*k* 98	95	100
Virginia Elec. & Pwr., 7% pf.	*k*111	105	110
WAGNER ELEC., 7% pf.	*b* 99	96¼*	99¼*
Wagner Elec., com.—no par	*b* 39¼	37¼*	40*
Washington Ry. & Elec., 5% com.	*k*480	180	475
Washington Ry. & Elec., 7% pf.	103	....	....
Washington Wtr. Pwr., 8% com.	*k*228	136	182
West Penn Elec., 7% pf.	113	109¼*	114¼*
West Penn Elec., Cl. A $7.	*k*110¼	106¼*	109¼*
West Penn Pwr., 7% pf.	115¼	114¼*	116¼*
West Penn Pwr., 6% pf.	110	109¼*	113*
West Virginia Lt., Ht. & Pwr., 7% pf.	*k* 95	94	100
Western Pwr., 7% pf.	*k*103	98	105
Western States Gas & Elec., 7% pf.	103	96	106
Western States Gas & Elec., com.	38	....	....
Westinghouse Elec. & Mfg., 8% com.—50	98¼	88¼*	100¼*
Weston Elec. Instrument, Cl. A $2—no par	*k* 31	30½*	33*
Weston Elec. Instrument, com.—no par	*k* 13	12¼*	14¼*
Wheeling Elec., 6% pf.	*k*104	95	104
Worthington Pump, 7% pf. A	*k* 52¼	46¼*	55*
Worthington Pump, 6% B	*k* 47½	41*	49¼*
Worthington Pump, com.	*k* 28¼	28*	34¼*
YALE & TOWNE com. $5—25	73	72¼*	75*

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, Feb. 11. *l*Bid price Wednesday, Feb. 15. *m*Latest quotations available. †Dividend rate variable. *1928

$15,000,000 par value, of the new stock and all of this amount was subscribed for and is being taken up.

STEADY INCREASE IN BUSINESS

Owing to an aggressive business policy, the company has been able to increase the sale of current to a total last year of 754,635,691 kw.-hr., which is an increase of nearly 12 per cent over the previous year and an increase of approximately 70 per cent since 1923. It is anticipated that this will be greatly increased when the new Hudson Avenue generating station is ready for operation, some time next summer. This addition will bring the total capacity of the station up to 340,000 kw. and there are still three more units to be installed. As power is now generated at this station with less than 1 lb. of coal per kilowatt-hour the outlook for increased earnings is attractive, especially since operating costs are being exceedingly well regulated.

A study of these operating costs by items for the past year is illuminating: Taxes required 12.63 per cent of the total, or an amount of $4,700,000; wages took 25.7 per cent, coal 9.12 per cent and other operating expenses 11.21 per cent; interest and amortization costs were 6.8 per cent, dividends were 17.6 per cent, which figures out to .8 per cent on the capital stock outstanding at the time, and reserves and surplus amounted to 15.29 per cent. The balance of 1.4 per cent is going to the employees' profit-sharing plan. Taking the financial statement as a whole, there are few operating power and light companies in the country which show a stronger financial position and a more favorable future.

New Capital Issues

First lien and collateral trust gold bonds, series A, of the Central Arkansas Public Service Corporation were offered to the public during the past week at 94½ and accrued interest, to yield about 5.45 per cent. This involved a total of $2,700,000. These bonds, dated Feb. 1, 1928, will mature Feb. 1, 1948.

The Alabama Power Company recently issued 20,000 shares of $5 cumulative preferred stock at $97.50 per share, the stock being fully paid and non-assessable.

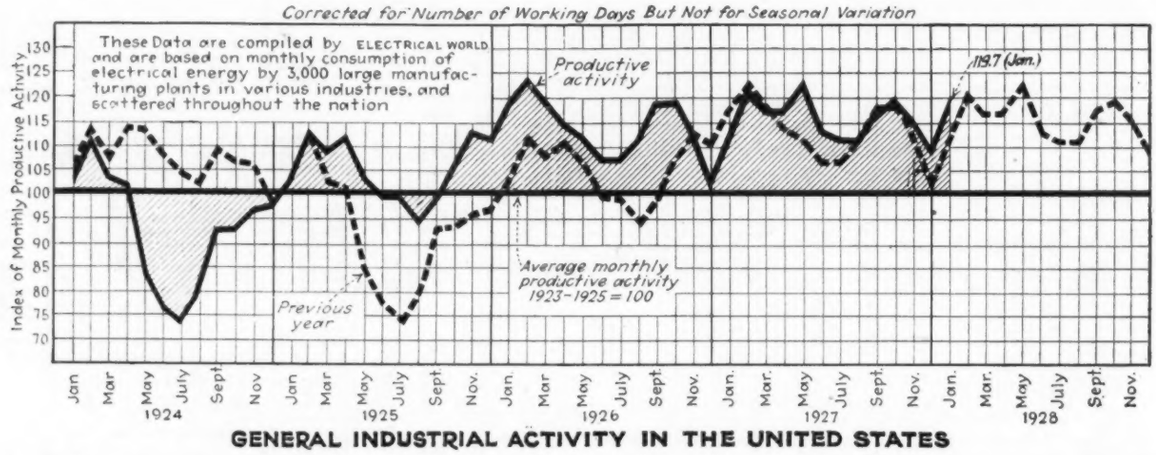
WEYMOUTH COMPANY TO ISSUE STOCK.—The Massachusetts Department of Public Utilities has approved the issue by the company at $30 a share of 3,338 shares of additional capital stock, par $25.

1928 Opens with Materially Increased Production

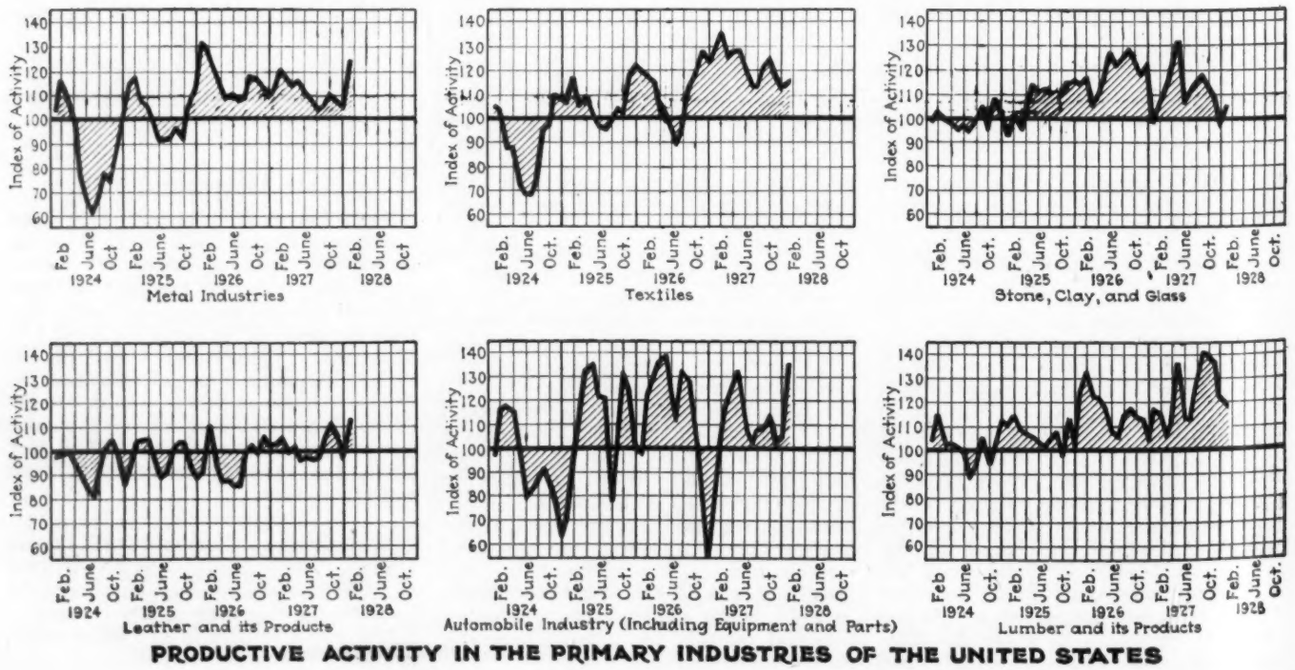
More Than Normal Seasonal Increase in Productive Operations During January — Practically all Industrial Groups Reported Materially Increased Operations

THAT the general feeling of business and industrial optimism which seems to pervade practically every section of the nation is based upon a solid foundation is borne out by data just made available upon general industrial production during January as indicated by the consumption of electrical energy. Reports of energy consumption during January made to ELECTRICAL WORLD by some 3,000 large manufacturing companies indicate that the rate of industrial production during January was about 9 per cent over that witnessed during December, after correction is made for the number of working days in the two months. This is about the rate of increase reported for January, 1927, over December, 1926, but is materially greater than the increase in rate of general production witnessed during the same month in 1923, 1924 and 1925. It would appear, therefore, that the current January witnessed increased productive activities over December on a scale slightly greater than that which would normally be expected for the month. It also appears from the basic data that American industry as a whole enters 1928 on a slightly higher plane than at the opening of 1927, the current January rate of activity being about 7.4 per cent over that reported for January last year.

Only three of the nation's primary industrial groups—food and kindred products, lumber and its products and paper and pulp—reported a rate of productive operations during January under those of December. On the other hand, the following basic industries reported the indicated increased rate of operations over December: Chemicals and allied products 14 per cent, rolling mills and steel plants 18 per cent, ferrous and non-ferrous metal working plants 16 per cent, leather and its products 14 per cent, rubber and its products 25 per cent, stone clay and glass 6 per cent, textiles 4 per cent and the automobile industry, including the manufacture of equipment and replacement parts, 27 per cent. These increased rates of productive operations during January indicate that American industry in practically all its branches felt a materially upward impulse as the year opened. An upward trend of considerable proportions is to be expected at this season of the year, but the fact that the impulse was felt by a very large proportion of the industrial groups instead of being confined largely to a few groups is a significant fact, offering an excellent basis for prognosticating a continuance of our present industrial prosperity at least through the first half of 1928.


Corrected for Number of Working Days But Not for Seasonal Variation
These Data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,000 large manufacturing plants in various industries, and scattered throughout the nation
Index of Monthly Productive Activity
Productive activity
119.7 (Jan.)
Average monthly productive activity 1923-1925 = 100
Previous year
Jan Mar May July Sept Nov Jan Mar May July Sept Nov Jan Mar May July Sept Nov Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept Nov.
1924 1925 1926 1927 1928

GENERAL INDUSTRIAL ACTIVITY IN THE UNITED STATES


Index of Activity
Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct.
1924 1925 1926 1927 1928
Metal Industries
Textiles
Stone, Clay, and Glass
Leather and its Products
Automobile Industry (Including Equipment and Parts)
Lumber and its Products

PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE UNITED STATES

Business News and Market Conditions

Conference on Refrigerator Standardization

A general conference of manufacturers, dealers and consumers to consider the standardization of refrigerators will be held in New York in March under the auspices of the American Engineering Standards Committee. A preliminary meeting was recently held to consider requests for standardization received by the committee from the American Home Economics Association and the American Institute of Architects. It was the view of both these bodies that specifications and standards which would tend to bring about improvements in food-keeping performance and ice economy of household refrigerators should be developed on a national scale under the auspices of the American Engineering Standards Committee, with the possible establishment of carefully defined grades of refrigerators.

All representatives at the preliminary conference were agreed that work along standardization lines was necessary, and that it should be accompanied by education of consumers to the proper selection and use of refrigerators. It was pointed out that the economic questions involved are too important to be neglected; for example, an extra inch of efficient insulation in a refrigerator will pay dividends at the rate of 18 per cent on a box used only six months out of a year. Several organizations will be invited to name delegates if the conference decides to initiate the work. As part of its effort to consider the point of view of all groups before undertaking the work the committee invites comment and suggestions on this project from all those interested in domestic refrigeration.

SHIPMENTS OF DOMESTIC PUMPS AND WATER SYSTEMS

Year and Month	Water Systems, Electrically-Driven—Deep-Well (3-Hp. and Smaller) Number of Units	Deep-Well (3-Hp. and Smaller) Net Sale Price	Shallow-Well—Under 500 Gal. per Hour Number of Units	Shallow-Well—Under 500 Gal. per Hour Net Sale Price	Shallow-Well—500 Gal. per Hour and Over Number of Units	Shallow-Well—500 Gal. per Hour and Over Net Sale Price
1926						
July	1,076	$117,670	5,937	$435,669	413	$47,015
August	1,283	133,895	5,667	409,467	288	33,834
September	1,352	121,625	5,118	374,300	346	29,915
October	1,019	100,834	5,474	385,976	298	24,927
November	865	87,285	4,578	313,264	239	19,629
December	854	69,865	3,524	256,028	270	24,265
Total (year)	10,738	$1,073,575	59,247	$4,407,277	3,591	$404,249
1927						
January	756	$51,695	3,751	$247,429	118	$7,932
February	883	69,339	3,621	251,849	141	10,239
March	763	72,850	4,590	318,190	81	7,079
April	1,077	96,692	4,998	357,004	125	17,045
May	1,109	93,014	6,021	388,645	136	16,008
June	1,104	106,935	6,870	440,535	158	16,104
July	1,031	85,524	6,023	420,131	126	14,012
August	1,111	*102,793	*7,120	446,645	113	14,833
September	1,136	91,924	6,668	397,639	106	10,187
October	1,042	88,325	6,492	406,732	95	7,081
November	918	75,946	6,029	354,833	132	8,310
December	757	53,831	4,934	260,338	289	11,705
Total (year)	11,687	$988,868	67,283	$4,301,025	1,620	$140,535

* Revised.

Domestic Pumps and Water Systems

Shipments of domestic pumps and water systems as reported to the Department of Commerce by 32 manufacturers are shown in the table above. It presents a comparative statement of shipments for the last half of the year 1926 and shipments for all of the year 1927.

Imports of Electrical Apparatus Into United States by Commodity and by Country of Origin for the year 1927

(Data furnished by the Bureau of Foreign and Domestic Commerce)

Article	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Carbon-filament incandescent electric lamps:				
Miniature	$16,324	$59,858	$151,565	$181,259
Other lamps	254,407	137,723	125,989	125,106
Metal-filament incandescent electric lamps:				
Miniature	19,901	4,642	14,027	13,539
Other lamps	70,753	35,428	12,486	31,096
Other electric lamps, including neon, etc	1,375	6,440	911	2,073
Generators	210	.....	6,728	.....
Transformers	.....	3,437	.....	.....
Converters, double-current and motor-generators, dynamotors and other converting apparatus	147	.....	35	.....
Switches, circuit breakers, fuses, choke coils, reactors, sockets, plugs, etc	1,438	1,594	1,582	2,918
Motors, stationary, railway, vehicle, automotive, and other	6,104	2,218	468	1,016
Electric fans and blowers	32	26	.....	.....
Table household, kitchen and hospital utensils and similar hollow or flat ware containing electrical heating element:				
Electric flatirons	17	143	101	6
Iron or steel-enameled or glazed with vitreous glasses	149	425	1,005	1,516
Copper, brass, steel or other base metal	1,416	456	300	3,650
Industrial electric furnaces and ovens	.....	345	101	.....
Therapeutic apparatus and X-ray machines	797	1,535	775	896
Radio and wireless apparatus and parts	10,198	119,688	115,469	110,696
Telegraph apparatus	2,226	58	2,125	631
Telephone apparatus	184	251	.....	312
Storage batteries and parts	2,773	1,642	5,950	1,826
Batteries other than storage	106	5	155	598
Electrical machinery and parts	288,714	433,114	222,490	246,861
Electric apparatus and parts	19,192	51,209	32,005	60,164
Total	$696,463	$860,237	$694,267	$784,163

Country	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Austria	$77,527	$5,434	$11,405	$23,189
Australia	4	.....	.....	19
Azores and Madeira Islands	.....	.....	39	.....
Belgium	1,218	303	35	43
Brazil	10	8	31	10
British West Indies	10	.....	.....	.....
Canada	5,440	11,261	10,170	12,009
Ceylon	7,423	.....	.....	.....
China	3,401	.....	17	585
Cuba	256	3	.....	5
Czechoslovakia	13,316	263	968	672
Denmark	.....	228	.....	.....
France	12,013	18,982	5,781	13,757
French Oceania	.....	90	.....	.....
Germany	187,790	195,050	226,864	234,741
Hungary	1,530	.....	.....	.....
Irish Free State	.....	.....	4	.....
Italy	562	1,300	844	1,996
Japan	105,848	153,895	207,342	235,115
Mexico	260	.....	.....	300
Netherlands	937	430	2,200	7,244
Norway	.....	33	.....	.....
Philippine Islands	.....	.....	7	.....
Rumania	4	.....	.....	.....
Spain	120	58	124	194
Sweden	66,025	78,133	32,682	178,550
Switzerland	198,433	261,412	160,776	13,542
United Kingdom	14,336	133,354	34,978	62,192
Total	$696,463	$860,237	$694,267	$784,163

Market Conditions

SALES in the New England district have decreased, motor business has dropped off and no equipment orders of special interest were reported. There is a marked upward trend in new building projects, with mercantile types predominant. Industrial inquiries in the Eastern market are better. The steel industry looms as an important consumer in the next 60 or 90 days. A steel company near Birmingham, Ala., placed an order for about $150,000 worth of equipment. No outstanding orders were placed in the Southeast, though the number of inquiries received was satisfactory. In the St. Louis district business is at a normal level. An oil refinery bought about $10,000 worth of motor apparatus, and a number of orders are being placed for line construction material. Industrial buying improved in the Middle West and utility companies continue to be busy with a large amount of construction work. On the Pacific Coast pole-line hardware sales are prominent, miscellaneous small telephone line jobs are reported in the Shasta and Diablo districts, and the Patterson irrigation project and the Turlock Irrigation District will soon be in the market for transmission line apparatus, pumps and motors.

Copper Steady with Tendency to Weaken—Lead Drops

After ruling at 6½ cents for 2½ months the price of New York lead has been cut to 6.35 cents, tin continues its downward course, zinc has eased slightly, but copper prices are maintained with "primary" producers firm at 14⅛ cents Connecticut, despite shading on the part of custom smelters. Business has not been brisk in any of the metals, although the cut in lead stimulated some buying. The copper situation is much the same as it has been for a month or more, with a tendency to weaken. The tonnage sold is well below average.

NEW YORK METAL MARKET PRICES

	Feb. 8, 1928 Cents per Pound	Feb. 15, 1928 Cents per Pound
Copper, electrolytic	14.075	14-14⅛
Lead, Am. S. & R. price	6½	6.35
Antimony	11	11
Nickel, ingot	35	35
Zinc spots	6	5.92½
Tin, Straits	53	51⅛
Aluminum, 99 per cent	24.30	24.30

Base copper wire price Feb. 15, 1928, 15¼ cents.

Predictions made two or three months ago that lead prices would advance before they would decline have proved to have been uninspired, for on Friday, Feb. 10, the American Smelting & Refining Company cut its contract price from 6½ cents, New York, at which level it had held since Dec. 1, to 6.35 cents. Other producers met the cut, and in fact, on Tuesday or Wednesday it might have been possible to shade this price by five points or so. The St. Louis market has also weakened. Producers are frankly uneasy over the drop in London, which has been largely accountable for the decline on this side. United States producers are not burdened with excess stocks, but the market cannot stand an inflow of bullion lead from foreign sources which would have eventuated had not prices been reduced as they have. Buying of lead has been fairly active since the prices dropped, with all classes of consumers in the market to some extent, and early delivery generally in most demand. Consumers have been buying tin on the breaks and traders have been selling. Forward prices are slightly less than prompt, but the difference is hardly more than ⅛ cent.

Inquiries Good in Southeast—No Outstanding Orders

No outstanding orders were placed in the Southeast, though the number of inquiries received was satisfactory. Central-station companies are slow in starting to buy under the new budgets, but it is expected that the movement will shortly improve. A power company in Tennessee ordered high-tension insulators amounting to $15,000, while a Georgia company ordered three 667-kva. transformers and $13,000 worth of distribution and small power transformers. There is a very satisfactory amount of substation equipment business in more or less immediate prospect. Line construction materials are active, one company ordering weatherproof wire amounting to $12,000 and creosoted pine poles totaling $6,400. Another order in this line was for insulators, cross-arms and hardware amounting to $5,300. In a flatiron campaign just closed one of the larger central-station companies sold 5,620 irons in ten days.

Buying on the part of municipalities is more active than for some time past and is ahead of that usually noted for this period of the year. "White-way" equipment is active, three towns in Georgia ordering to the extent of $4,000, $3,500 and $3,000, respectively. Another town in the same state ordered line construction materials amounting to $1,000.

Construction projects are as follows: The Alabama, Tennessee & Northern Railroad Corporation plans terminal and repair shops at Mobile, Ala., to cost $250,000. Libby, McNeill & Libby, U. S. Stock Yards, Chicago, Ill., plans a milk condensory at Tuscaloosa, Ala., to cost $200,000. The Columbus Electric & Power Company, Columbus, Ga., plans a one-story substation on Tenth Avenue, to cost $40,000. The United States Foil Company, Louisville, Ky., plans a plant addition to cost $350,000. S. R. Morgan & Company, Little Rock, Ark., plans an ice plant at Aberdeen, Miss., to cost $100,000. The Mississippi Power & Light Company plans lighting and power system at Hickory Flat, Miss. The Powell Knitting Company, Spartanburg, S. C., will soon take bids for a new mill to cost $100,000. The Community Electric Company and the Blue Ridge Talc Company, Henry, Va., plan to rebuild their plants destroyed by fire with loss of $215,000. The Hooker-Bassett Furniture Company, Martinsville, Va., plans a new factory to cost $150,000. The Stanley Milling Company, Stanley, Va., plans rebuilding the portion of its mill destroyed by fire with loss of $150,000. The Appalachian Electric Power Company plans a substation at Madison, W. Va. The Kentucky Power Company, Brooksville, Ky., and the Carolina Power & Light Company plan extensions in transmission lines. Miami, Fla., and Portsmouth, Va., plan ornamental lighting systems.

Business in St. Louis at Normal Level

Business in the St. Louis district is at a normal level. An order for sixteen 25-hp. motors with control, metering equipment and transformers was placed by a large oil refinery company and amounted to $10,000. A switchboard for $1,800 and another for $1,100 were sold to power companies in the south and western part of the district. The demand for stock sizes of motors and transformers shows slight improvement. Several orders are being placed for line construction material.

Construction projects are as follows: The North Arkansas Power Company, Mountain Home, Ark., plans a light and power plant at Salem, Ark.; also, an ice plant. The Arkansas Power & Light Company plans a 110,000-volt transmission line from Pine Bluff to Camden, Ark. Hannibal, Mo., plans extensions in its municipal power plant to cost $150,000. Kennett, Mo., plans a municipal power station to cost $30,000. Sweetwater, Tex., and Oakdale, La., will install ornamental lighting systems. The Thompson Can Company, Dallas, Tex., plans a new plant to cost $100,000.

Sales Volume Decreases in New England District

A slight sag in the sales volume is noted in the New England district. Motor sales dropped off and no equipment orders of special interest were reported. Central-station supplies are moving very slowly, some interest in cable, wire and hardware is recorded and emergency repair orders for work in southern Vermont are being received in limited number. The Gloucester Electric Company recently purchased new switch and control equipment for replacement purposes. A number of small lot transformer orders is expected, but activity as a whole is lessening. A manufacturer of electric furnaces reports an order for a special type continuous feed heater. Industrial plant lighting is active and a Salem manufacturing company is planning

its adoption on a large scale. Electric range sales are encouraging in the Maine and Vermont districts. In the former 90 ranges were sold recently.

New England shows a marked upward trend in new building projects, mercantile types predominating. A number of factory additions and changes are being planned. An ice plant, costing about $100,000, will be erected in Brockton, the Carver Cotton Gin Company plans a plant addition, several shoe and industrial plants are planning for an increase in power load and the General Motors Corporation is considering an assembly plant at Stoughton, Mass.

Industrial Inquiries Better in Eastern Market

Industrial plant inquiries in the Eastern district point to early improved sales. The steel industry looms as an important consumer in the next 60 to 90 days. The improved operations in this field are leading not only to advance inquiries but immediate commitments. A steel company near Birmingham, Ala., has placed an order for a turbine unit, condenser and switchboard, totaling about $150,000, with a large manufacturer; the American Steel & Wire Company, Cleveland, is expected to buy a heavy amount of equipment, with an appropriation of $5,000,000, for extensions and improvements in Eastern and Western mills during 1928; the Sheffield Steel Corporation, Kansas City, Mo., is another prospective purchaser, with a fund of about $2,500,000, for plant expansion, including a new combination bar and rod mill, and the Southern Ornamental Iron Works, Dallas, Tex., will soon buy equipment for a plant at Arlington, Tex., to cost more than $200,000. Business in smaller industrial equipment, including fractional-horsepower motors shows tendencies for marked betterment. A manufacturer of automatic ticket registers has placed a contract for 1,500 motors of 1/50-hp. rating, totaling about $14,000; a producer of electric-operated coin counters has ordered 50 motors of 1/20 hp. at $700, and a manufacturer of compressors has contracted for 125 motors, divided in 1-hp. and 2-hp. sizes, at a cost of $4,000.

In the Philadelphia district manufacturers are encouraged by the advancing quota of inquiries, with industrial apparatus for new enterprises forming the largest percentage. Ice and cold storage plants in this territory, including southern New Jersey, will soon buy considerable machinery. Textile mills are coming into the market for motors and control equipment, and leather plants are showing expansion for early requirements.

Construction projects include the following: The Fur Merchant's Cold Storage Company, New York, plans a ten-story cold storage plant addition to cost about $300,000. The Rochester Gas & Electric Corporation, Rochester, N. Y., plans extensions in transmission lines in Monroe and Ontario Counties. The Riley Milk & Ice Company, Pitman, N. J., plans an addition to its ice and cold storage plant to cost about $100,000. The Bureau of Supplies and Accounts, Washington, D. C., will receive bids until Feb. 28 for lighting and power cable for the Philadelphia, Pa., navy yard (Schedule 8487); also, until Feb. 21, for one Diesel engine, air compressor, etc., for the Charleston navy yard (Schedule 8497). The Pennsylvania Water & Power Company, Holtwood, Pa., will call for bids on the initial unit of a hydro-electric plant at Safe Harbor, Susquehanna River. The Eastern Shore Public Service Company, Salisbury, Md., has acquired properties in Talbot, Caroline and Queen Anne Counties and contemplates extensions in transmission lines. The General Supply Committee, Washington, is asking bids until March 2 for electrical supplies for 1928 (Class 6), and the Maryland Paper Mills, Inc., will soon begin work on the first unit of its plant at Glen Burnie, Md., to cost $175,000.

Industrial Buying Improves in Middle West

Business in the Middle West continues to improve. So far the year has been up to reasonable expectations. Building operations in the Chicago suburban districts are increasing. Industrial activity is steadily improving. Utility companies continue to be busy with a large amount of construction work and a great deal more is contemplated. Maintenance purchasing is quite large. Jobbers' sales are steadily improving, although some irregularities are noticeable. Appliances are moving fairly well. A jobber placed an order for 1,000 vacuum cleaners.

Construction projects are as follows: The Central States Power & Light Corporation, Dubuque, Iowa, has acquired the system of the Gladwin Light & Power Company, Gladwin, Mich., and plans expansion. Emmetsburg, Iowa, plans the installation of a municipal power plant. The Iowa Railway & Light Company will improve its power plant at Nevada, Iowa, to cost $30,000. Mountain Lake, Minn., plans a municipal electric distributing system. Louis P. Wolff, Globe Building, St. Paul, Minn., engineer, plans a municipal power plant at Detroit Lakes, Minn., to cost $32,000. The Hinde & Dauch Paper Company, Sandusky, Ohio, plans a new mill at Sullivan, Ill., to cost $100,000. The Willys-Overland Company, Toledo, Ohio, plans an addition to its plant to cost $700,000. The Great Atlantic & Pacific Tea Company, Milwaukee, Wis., plans an electric-operated baking plant to cost $200,000. Stoughton, Wis., plans a municipal power plant to cost $30,000. The Detroit Edison Company plans a 120,000-volt steel tower transmission line from its Trenton Channel power plant to Detroit, Mich. The Iowa Railway & Light Company plans a transmission line from Boone to Roland, Iowa, and rebuilding of line from Maxwell to Collins, Iowa. The Northwest Public Service Company plans a transmission line at Columbus, Neb., and the Nebraska Power Company at Valley, Richfield, Neb. Langdon, N. D., and North Milwaukee, Wis., will install ornamental lighting systems.

Pole-Line Hardware Sales Prominent on Pacific Coast

Pole-line hardware purchasing has been active on the Pacific Coast. The Pacific Gas & Electric Company and the San Joaquin Light & Power Company being in the market for one car each and the Great Western Power Company for two cars. The latter company also purchased one carload of guy wire. Another power company purchased one carload of 11,000-volt insulators valued at $8,000. Miscellaneous small telephone line jobs are reported in the Shasta and Diablo districts. The Patterson irrigation project will require a total of 1,650 hp. of pumps and motors. The Turlock Irrigation District is requesting bids for construction of 14 miles of transmission line.

The city of Oakland, Calif., is in the market for 12,000 ft. of dredging cable, a lime company needs $2,500 worth of wiring material and ten assorted motors from 25 hp. to 100 hp., a new state fair building in Sacramento needs about $2,000 worth of reflectors and wiring material. The city of Los Angeles has purchased $19,000 worth of street-lighting transformers. New construction includes an administration building for the Fabiola hospital in Oakland to cost $700,000, and a million-dollar addition to the Olympic Club in San Francisco.

Electric range sales in Seattle during January showed a considerable decrease over those of December. Smaller appliance and table-ware sales are on the increase. Several substation transformers were purchased by the Puget Sound Power & Light Company for the Baker River and Seattle plants, fifteen motors from 25 hp. down to a lumber mill in Tacoma and about 30 from 50 hp. down for miscellaneous mill and woodworking plants in the Puget Sound district. Some sales of small motors to dealers in Grays Harbor and in eastern Washington are reported, but the volume was below the average.

Construction projects are as follows: The Benbow Power Company, Benbow, Calif., plans a hydro-electric plant on the Eel River, to cost $200,000. The Southern California Edison Company plans a 120,000-volt transmission line from Saticoy to its substation at Castiac, Calif., to cost $400,000. Los Angeles, Calif., plans a two-story substation on South Figueroa Street to cost $105,000. The Pacific Coast Steel Company, San Francisco, plans an addition to its plant to cost $500,000. The Great Northern Utilities Company plans a power plant at Shelby, Mont., to cost $300,000. The Utah Woolen Mills Company, Salt Lake City, plans a new mill to cost $175,000. Burbank, Monrovia, San Leandro and Whittier, Calif., plan ornamental lighting systems.

Activities of the Trade

Servel Elects Directors

At a meeting of Servel, Inc., the following directors were elected: Nicholas F. Brady, George W. Davison, William H. McCurdy, Ernst Aurell, Murray H. Coggeshall, C. A. Dana, Richard E. Forrest, W. S. Gray, Jr., Richard C. Hunt, John Higgins, George P. Smith, M. G. B. Whelpley and Col. Frank E. Smith.

Edison Lamp Works Plans Merchandising Campaign

The "Out-in-Front" campaign, the third of a series of semi-annual merchandising drives, will be made by the Edison Lamp Works of the General Electric Company during the month of March. The campaigns have the twofold object of educating agents to modern merchandising methods as well as to increase the sale of lamps. Better window and counter displays are the aim summed up in the slogan adopted and by means of which the company will stimulate its 15,000 agents to a nation-wide drive.

Electric Refrigeration Elects Three New Directors

The Electric Refrigeration Corporation of Detroit at a recent meeting elected three new directors, as follows: Jules S. Bache, head of J. S. Bache & Company; D. B. Lee, chairman of the Motor Products Corporation, Detroit, and Harlan T. Pierpont, Springfield, Mass. At the meeting plans were laid to change the name of the corporation to the Kelvinator Corporation.

Westinghouse Veterans Hold First Annual Dinner

The first annual dinner of the New York chapter of the Veteran Employees' Association of the Westinghouse Electric & Manufacturing Company was held at the Pennsylvania Hotel on Wednesday evening. This association, which has a membership of over 3,500, is made up of employees all over the country who have twenty or more years of service to their credit with the Westinghouse organization. There are fifty-five employees with forty years of service to their credit in this association.

C. E. Stephens, Northeastern sales manager of the company, who is president of the New York chapter of the association, presided at the meeting. After outlining the plans for the coming year, Mr. Stephens introduced E. H. Sniffin, who acted as toastmaster. Mr. Sniffin in turn introduced Walter P. Holcombe, vice-president of the Brooklyn Edison Company, who spoke to those in the banquet hall on "Veterans' Service." Another speaker was John J. Jackson, general attorney of the Westinghouse company, whose subject was "The Acid Test." Until this year those eligible in the New York district to join the association were affiliated with the Pittsburgh chapter, but during the last year so many in the New York office have joined this association it was deemed necessary to establish a New York Chapter. At a recent meeting, sixty chapter members were present. Officers elected at that time were: W. J. Massey, vice-president; Carl L. W. Baotz, secretary; C. V. Holmes, treasurer, and Miss C. C. Bickel, C. C. Bawden, and F. M. Garretson, trustees.

First Allis-Chalmers Unit Started at Conowingo

The first of the four 54,000-hp. turbines built by the Allis-Chalmers Manufacturing Company, Milwaukee, for the Conowingo development on the Susquehanna River has been started. The immense size of these turbines will be apparent from the fact that the steel runner, or rotating part of each machine, weighs 100 tons, and that the valve admitting water to each turbine is 27 ft. in diameter. The Conowingo development forms one line in the chain of the system of the Philadelphia Electric Company. The project, one of the largest hydro-electric developments in the world, represents an investment of $52,000,000.

THE W. R. OSTRANDER ELECTRIC WORKS, 911 Atlantic Avenue, Brooklyn, N. Y., has placed on the market a floor receptacle with a shallow box and a small diameter nozzle. It is designed for 250 volts, 10 amp.

THE CENTRAL FLATIRON MANUFACTURING COMPANY, Johnson City, N. Y., announces the appointment of John W. Stiles & Son, Cleveland, as its representatives for the "Betsy Ross" line of electric appliances in Ohio, Indiana and Kentucky. The company also announces that the George W. Underhill Company, St. Louis, has been appointed representative in the states of Iowa, Nebraska, Oklahoma, Texas, Arkansas, Missouri and southern Illinois.

THE MCGILL MANUFACTURING COMPANY, Valparaiso, Ind., manufacturer of lamp guards, sockets, switches, etc., announces an improvement in its "Levolier," Cat. No. 61, fixture switch.

THE AUTOMATIC ELECTRIC HEATER COMPANY, 1505 Race Street, Philadelphia, is offering a new line of water heaters equipped with a by-pass that will not allow any hot water to drip when house faucets become defective or are left partially closed.

THE STEINMETZ HEATING COMPANY, INC., 30 Church Street, New York City, announces that it has been awarded a contract by the 963 Fifth Avenue Corporation, New York, for 60 flush-type wall insert electric heaters, "Globar" equipped, for use in the bathrooms of an apartment house.

THE BENJAMIN ELECTRIC MANUFACTURING COMPANY, 120 S. Sangamon Street, Chicago, has prepared a new reference wall chart which will enable the selection of the right type, size and catalog number of any Benjamin reflector or other industrial lighting equipment.

THE AMERICAN ELECTRIC SWITCH CORPORATION, Minerva, Ohio, announces the acquisition of the Nyelec Switchboard Company, 422 E. 53d Street, New York City. The Nyelec Switchboard Company will retain its New York office, factory and personnel and will operate as the Nyelec division of the American Electric Switch Corporation. The sales for the present will be handled by the American Electric Switch Corporation sales organization.

THE STANDARD ELECTRIC STOVE COMPANY, Toledo, Ohio, announces that J. D. Behnke has been appointed district representative for western Missouri, Kansas, Oklahoma and southern Nebraska, with headquarters at Kansas City. Mr. Behnke formerly covered the same territory for the Commercial Electrical Supply Company of St. Louis.

THE BRYANT ELECTRIC COMPANY, Bridgeport, Conn., has placed on the market its No. 782 expulsion type surface switch, built especially for inductive loads, for controlling three-phase alternating-current motors up to and including 2 hp. It is reversible triple-pole, with a rating of 20 amp., 250 volts or 10 amp., 600 volts.

THE TRUMBULL-VANDERPOEL ELECTRIC MANUFACTURING COMPANY, Bantam, Conn., announces the appointment of Leighton B. Underwood as district sales manager in Philadelphia. L. B. Underwood & Company, of which Mr. Underwood has been head, was a manufacturers' representative, and has carried the Trumbull-Vanderpoel line of safety switches for many years.

THE LINCOLN ELECTRIC COMPANY, Cleveland, announces the appointment of A. M. MacFarland as a general sales and development engineer, who will devote his efforts to the development and special application of automatic carbon arc welding, with headquarters at Cleveland.

THE WAGNER ELECTRIC CORPORATION, St. Louis, announces the opening of a new branch sales office at 475 West Peachtree Street, N.E., Atlanta, Ga., to cover the states of Georgia, Alabama and Florida, until recently a part of the St. Louis sales territory. Roy F. Druschky, who has been with the company for sixteen years and until recently a salesman in the St. Louis territory, has been put in charge of the Atlanta branch office.

THE HOOVER COMPANY, North Canton, Ohio, maker of Hoover electric cleaners, is placing on the market a floor polishing attachment for use in connection with its various models.

New Equipment Available

Instrument and Control Switches

A new type of switch used for connecting any instrument or group of instruments selectively into various circuits as may be required for metering, synchronizing or other switching functions has been placed on the market by the Westinghouse Electric & Manufacturing Company. These switches are of the rotary type and are especially adapted to mounting in small space.

The switches are made in six standard lengths. The many combinations required are assembled from a relatively small number of standard segments and insulating arc-resisting spacers. All switches are insulated for 600-volt service for alternating or direct current. The contacts will carry 10 amp. continuously and will open 5 amp. under normal conditions. These switches can be mounted 3 in. apart horizontally and 5¼ in. vertically between center lines.

Automatic Time Switch

A motor-operated automatic time switch for controlling alternating-current circuits where the load is less than 10 amp., has been placed on the market by the General Electric Company. This device will be designated as the T-8 switch, and may be used for the control of show-window lighting, electric signs, protective lights, and many industrial applications where circuits are required to operate regularly during a certain portion of each day. Two arms, registering on the revolving dial of the switch can be set at half-hour intervals to control the making and breaking of the load circuit, the maximum time interval being 11½ hours. The time keeping element of the switch is a small disk-type synchronous motor having a consumption of 3 watts.

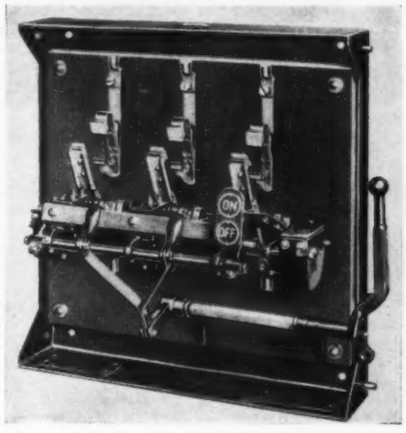
Potheads

A new line of potheads has been added to the distribution products made by the Line Material Company, South Milwaukee, Wis. The potheads are so designed that any type may be assembled quickly from standard interchangeable parts. Owing to the type of design the company states that prompt delivery is insured on all orders. The potheads are made for indoor or outdoor service and for one, two, three or four conductors in any type such as side-entrance, flat-straight, 135-deg. angle, 90-deg. front entrance, tap-off type, bracket type, etc.

SECONDARY RACK.—A line of Peirce "Presteel" electro-welded secondary racks in both the heavy service and the light service types and which the manufacturer claims has greater strength per pound has been placed on the market by Hubbard & Company, Pittsburgh. In this line of racks there are no rivets, no pockets to hold moisture and no lapping of material to start rusting. The mounting holes on both the heavy service and light service racks have exactly the same spacing.

Inclosed Circuit Breakers

A complete line of inclosed circuit breakers in capacities from 5 amp. to 800 amp. has been placed on the market by the Roller-Smith Company, 233 Broadway, New York City. The type ESF, shown in the illustration, is a free-handle breaker and the type ES, which is not of the free-handle type, has the handle projecting directly through



TYPE ESF FREE-HANDLE CIRCUIT BREAKER WITH COVER REMOVED

a slot or slots, depending on the number of poles, in the front cover. These two types are for use on potentials up to 600 volts for direct or alternating-current service, are made with one, two, three, or four poles, with overload or undervoltage release or combinations and with instantaneous or time-limit trip. The type EI is made in capacities from 3 amp. to 100 amp. and is generally similar to the type ES except that the breaker itself is of the industrial type instead of the standard type. It does not have the fine finish of the ES line, but all parts are dipped and lacquered and they are built for hard use. They are for use on potentials up to 250 volts on direct or alternating current, are made for one, two, three or four-pole service, can be provided with overload or undervoltage release or combinations and have an instantaneous trip only.

With these circuit breakers the box can be installed first, if desired, and the breaker mounted at a later date. The box is so designed as to provide all safeguards against damage due to the explosion and liberation of gases that take place when a breaker opens under a heavy load. Changing a breaker can be easily accomplished.

Centrifugal Air Compressors for Cupola Blowing

A cupola blowing equipment which it is claimed will greatly improve the efficiency of the melting operation has been developed by the General Electric Company. This equipment automatically insures the supply of a constant weight of air to the cupola, irrespective of atmospheric conditions and the resistance through the cupola. The new equipment will be manufactured with either hand or automatic control, and can be set to give the proper weight of oxygen to meet varying operating conditions. A meter indicates the volume of air flowing for standard conditions. Constant-speed motors are used with all sets, except when direct-current motors are required. As a result, the weight of air flowing into the cupola is not controlled by variable speed, but by opening and closing the blast gate.

Hollow-Square Bus Support

A new line of bus-bar supports known as the modified hollow-square type and particularly adapted to heavy low-voltage bus construction has been developed by the Westinghouse Electric & Manufacturing Company. These supports consist of heat-treated aluminum alloy clamps which are insulated from the standard 1¼-in. pipe of the mounting support by means of high-grade micarta tubes. The bus support is designed for 4-in. x ¼-in. bus bars and for a maximum of 4,000 volts alternating or direct current. The support may be adjusted to carry one or twelve bars so the bus may be tapered as feeders are tapped off or installation of additional bus copper to provide for an increasing load may be easily made.

ELECTRIC MOLD DRYING UNIT.—An electric heating unit for drying large sand molds in brass, steel or iron foundries has been designed by the General Electric Company to obviate the attention required by the kerosene lamps, stoves or other fires usually employed. The device consists of a helicoil sheath-wire unit cast into iron. The terminals are protected by a cast-iron cap with an insulated hole in it, through which lead wires may be brought. The unit is designed to operate directly on the line voltage. It is rated 1,250 watts at either 110 volts or 220 volts. It has a shipping weight of approximately 10 lb., the over-all length is 21 in., length of heating surface, 18 in., width, 2¼ in., and thickness, 1 in.

DRUM SWITCHES.—Three new drum switches are announced by the General Electric Company for use with squirrel-cage and slip-ring motors. They have been designed particularly for the control of small cranes, hoists, machine tools, etc., but can be applied on any work where a small and inexpensive drum switch is desired for the control of the types of motors mentioned.

Electrical Patents

Announced by U. S. Patent Office

(Issued Jan. 31, 1928)

Reissue 16,865. OIL REFINING STILL AND METHOD OF MAKING THE SAME BY ELECTRIC WELDING; L. R. Smith, Milwaukee, Wis. App. filed Dec. 31, 1924.

1,657,452. LIGHTNING ARRESTER; A. L. Atherton, Pittsburgh, Pa. App. filed Sept. 19, 1922. Multiple-gap type.

1,657,455. TROLLEY BASE; L. F. Burnham, Pittsburgh, Pa. App. filed Nov. 5, 1925. Of the roller-bearing type for supporting current-collector members.

1,657,459. CIRCUIT CLOSER FOR ELECTRIC ALARMS; F. Davis, Brooklyn, N. Y. App. filed Nov. 15, 1924.

1,657,465. ELECTRIC HEATING UNIT; F. F. Forshee, Mansfield, Ohio. App. filed March 12, 1926.

1,657,479. ELECTRIC HEATING DEVICE; F. MacFarland, Wilkinsburg, Pa. App. filed Dec. 2, 1922. Flexible electric heater.

1,657,486. SWITCHING MECHANISM; W. M. Scott, Tredyffrin Township, Chester County, Pa. App. filed April 21, 1924.

1,657,492. REGULATOR SYSTEM; C. A. Boddie, Wilkinsburg, Pa. App. filed Nov. 26, 1924. Actuated in accordance with a predetermined power factor of a supply circuit.

1,657,493. TESTING DEVICE AND METHOD FOR RAILWAY TRAFFIC CONTROLLING APPARATUS; P. N. Bossart, Swissvale, Pa. App. filed July 13, 1926.

1,657,495. MERCURY ARC RECTIFIER STARTING DEVICE; E. W. Breisch, Edgewood Park, Pa. App. filed Dec. 7, 1921.

1,657,507. CONNECTER; A. D. Keene, Pittsburgh, Pa. App. filed July 6, 1923. For electric resistance conductors.

1,657,513. REGULATOR SYSTEM; W. E. Menzies, Irwin, Pa. App. filed June 14, 1923. For maintaining a number of machines at definite relative speeds that are variable at will.

1,657,521. CONTROL SYSTEM FOR ELECTRIC RANGES; V. G. Vaughan, Wilkinsburg, Pa. App. filed Nov. 5, 1923.

1,657,543. PRIMARY CELL; R. B. Lynn, La Salle, N. Y. App. filed Feb. 9, 1926.

1,657,550. METHOD AND APPARATUS FOR COOLING ELECTRICAL APPARATUS; G. W. Saathoff, South Orange, N. J. App. filed April 29, 1922.

1,657,581. ELECTRICAL HEATING APPARATUS FOR THE CRUCIBLES OF LINOTYPE COMPOSING MACHINES; O. Mozzali, Treviglio, Italy. App. filed Oct. 23, 1922.

1,657,587. ELECTRICAL PULSE GENERATOR; M. I. Pupin, Norfolk, Conn. App. filed Aug. 7, 1924.

1,657,617. ELECTRIC CLOCK WINDING MECHANISM; F. A. Feldkamp, Newark, N. J. App. filed Jan. 19, 1927.

1,657,638. ELECTRICAL GAS IGNITING DEVICE; E. L. Payne, Los Angeles, Calif. App. filed April 6, 1925.

1,657,643. ELECTRIC HEATING MEANS; J. H. Reniers, Ben Avon, Pa. App. filed May 15, 1923. For stock such as rods, bars, wire, etc.

1,657,660. ELECTRIC CONTROL FOR STERILIZERS; F. Cedergren, Hammond, Ind. App. filed April 1, 1927.

1,657,671. ELECTRIC FURNACE TERMINAL; F. A. Fitzgerald, Niagara Falls, N. Y. App. filed June 10, 1925.

1,657,677. COMPENSATED INDUCTION MOTOR; F. Kade, Kiel, Germany. App. filed March 26, 1924.

1,657,681. SAFETY OVERLOAD DEVICE; I. E. McCabe, Chicago, Ill. App. filed Dec. 21, 1925. Thermostatic device.

1,657,688. SWITCHING MECHANISM; W. M. Scott, Tredyffrin Township, Chester Co., Pa. App. filed May 14, 1924.

1,657,714, 1,657,715. SWITCH MECHANISM; T. E. Griffith and L. L. Dodds, Cleveland, Ohio. Apps. filed March 5, 1923. For use in elevator cars for breaking the operating circuit of the car upon the opening of the door of the elevator inclosure.

1,657,785. ELECTRIC FURNACE; C. A. Calwell, Cleveland, Ohio. App. filed April 29, 1920. Of relatively high voltage.

1,657,794. CIRCUIT CLOSER FOR FLUID-LEVEL-INDICATING DEVICES; M. S. Elton and G. E. Barnhart, Pasadena, Calif. App. filed Feb. 10, 1925.

1,657,799. ELECTRICAL ATTACHMENT PLUG; L. Kellner, Chicago, Ill. App. filed Aug. 22, 1925.

1,657,808. ELECTRIC HEATER; A. Steffen, Pittsburgh, Pa. App. filed Aug. 11, 1925. Wall heater.

1,657,855. ELECTRICAL INDICATING INSTRUMENT AND CONTROL SYSTEM THEREFOR; H. L. Decker, Toledo, Ohio. App. filed Oct. 7, 1925.

1,657,886. DIRECT CURRENT METERING SYSTEM; J. Harris, La Fayette, Ind. App. filed Jan. 24, 1925.

1,657,900. CLOSED ELECTRIC MACHINE; H. Richter, Behringersdorf, near Nuremberg, Germany. App. filed Nov. 7, 1925. Mine pump motor.

1,657,904. ELECTRIC LIGHTER; T. C. Russell, Chicago, Ill. App. filed Nov. 30, 1925.

1,657,910. ELECTRICALLY-OPERATED REMOTE-CONTROL INDICATOR; S. B. Allen, Framingham, and L. R. Sutherland, Boston, Mass. App. filed Sept. 11, 1922.

1,657,928. SHIP TELEGRAPH; W. R. Hornberger, Philadelphia, Pa. App. filed Aug. 27, 1921.

1,657,932. ELECTRIC HEATER; P. Kukec, Chicago, Ill. App. filed July 12, 1927. Which may be installed in a boiler for generating steam.

1,657,933. ELECTRICAL CONNECTER; W. E. Lindsley, Brooklyn, N. Y. App. filed Feb. 15, 1927.

1,657,948. PROCESS IN THE EMPLOYMENT OF SELF-BAKING ELECTRODES; J. Westly, Kristiansland, Norway. App. filed Jan. 5, 1925.

1,657,969. ELECTRICAL CUT-OFF; E. W. Moon, Youngstown, N. Y. App. filed April 16, 1926.

1,657,970. CONE COUPLING FOR ELECTRICAL CABLES; E. Politi, Milan, Italy. App. filed Nov. 2, 1925.

1,658,010. ELECTRIC SWITCH; S. E. Skinner, New Britain, Conn. App. filed June 18, 1923. Switch having a plurality of terminals and means for electrically connecting the terminals in various combinations.

1,658,013. MERCURY SWITCH; R. W. Armstrong and I. E. McCabe, Chicago, Ill. App. filed Dec. 16, 1922.

(Issued Feb. 7, 1928)

1,658,028. ARMATURE ACTUATING MECHANISM FOR MAGNETOS; P. Brown, Springfield, Mass. App. filed Jan. 28, 1928.

1,658,056. ELECTRIC PRESSING OR FORGING MACHINE; G. H. Phelps, Warehouse Point, Conn. App. filed April 20, 1923.

1,658,071, 1,658,072. ELECTRIC FURNACE; J L. Bernard, Beaver, Pa. Apps. filed Dec. 15, 1926. In which the tops or roofs may be removed for charging.

1,658,142. ELECTRIC DRY BATTERY; K. Stamm, Berlin-Dahlem, Germany. App. filed Feb. 9, 1925. In which the electrolyte is stored in a separate closed vessel of breakable material.

1,658,158. DEVICE FOR AUTOMATICALLY DISCONNECTING ELECTRIC CIRCUITS; O. Dreyer, Essen-on-the-Ruhr, Germany. App. filed July 4, 1925. In case of an overload.

1,658,160. BATTERY TERMINAL CLAMP; C. Fisher, Chicago, Ill. App. filed March 24, 1927. For storage batteries.

1,658,194. SIGNAL; R. S. Harter, West Nanticoke, Pa. App. filed March 24, 1924. For use at street crossings.

1,658,206. LIGHTING FIXTURE; G. Matthyssen, Inglewood, Calif. App. filed Oct. 22, 1925.

1,658,222. ELECTROCLEANING; R. M. Burns, Brooklyn, N. Y. App. filed Feb. 10, 1925. Method of electro-cleaning metals.

1,658,237. AUXILIARY SOCKET CONNECTION; C. E. Godley, Detroit, Mich. App. filed Feb. 28, 1925. Means for affording a circuit connection from a wire terminal of a lamp socket or the like.

1,658,238. COMPARTMENTAL LAMP; C. E. Godley, Detroit, Mich. App. filed Feb. 24, 1926. Means for partitioning the lamp casing, for supporting the lamp bulbs and for affording controlled circuit connections to the several bulbs.

1,658,242. CONTROLLER FOR ELECTRIC MOTORS; R. B. Hunter, Shorewood, Wis. App. filed July 6, 1926. For motor operated woodworking machines.

New Trade Literature

LIGHTNING ARRESTERS.—The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, is distributing booklet No. 246, the second of a series of booklets describing the technical features of the crystal valve lighting arrester as they apply to modern lightning protectioo.

MOTORS.—Bulletin No. 202 issued by the Reliance Electric & Engineering Company, Cleveland, describes and illustrates the type T, heavy-duty Reliance motors for direct-current with ball and roller bearings. The bulletin is well illustrated and covers the advantage of ball and roller bearings in the motors.

BOILER.—The Edge Moor Iron Company, Edge Moor, Del., has issued catalog No. 65 describing the Edge Moor cross drum boiler and giving the principal facts concerning it. The catalog contains a description of the operation and performance of the boiler and also contains many photographs illustrating both the design and the construction. Included at the end of the catalog are the suggested rules for the care of power boilers embodied as section 7 of the A. S. M. E. boiler construction code.

WATER COOLING EQUIPMENT.—The Cooling Tower Company, Inc., 15 John Street, New York City, is distributing bulletin No. 278, entitled "Cooling Water in the Modern Power Plant."

RAILROAD TURNTABLES. — Bulletin GEA-890 issued by the General Electric Company, Schenectady, N. Y., describes and illustrates its alternating and direct-current railroad turntables.

CABLE AND OUTDOOR STATION EQUIPMENT.—The General Electric Company, Schenectady, N. Y., has issued bulletin GEA-923, covering its impregnated paper-insulated cable. The company is also distributing bulletin GEA-856, describing and illustrating its type FA-1 disconnecting switches for outdoor station equipment.

VALVES.—Bulletin No. 89 issued by the Wellman-Seaver-Morgan Company, Cleveland, describes the Wellman "Supertest" gate and globe valves. Complete dimensional data on the various types are included.

CRANES. — The Whiting Corporation, Harvey, Ill., has issued bulletin No. 179, covering the operation and maintenance of Whiting electric cranes. Various illustrations show the construction of the different types of cranes.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Hamburg, Germany (No. 29,577), of dishwashing machines.

Purchase is desired in Dresden, Germany (No. 29,602), of heaters, space, industrial; and ventilating equipment.

Purchase and agency are desired in Rome, Italy (No. 29,519), for heating and cooking equipment.

An agency is desired in Vancouver, Canada (No. 29,521), for household appliances.

Purchase is desired in Hamburg, Germany (No. 29,577), of refrigerators and electric shoe-shining machines.

Purchase is desired in Seville, Spain (No. 29,605), of wiring devices and electrical installations.

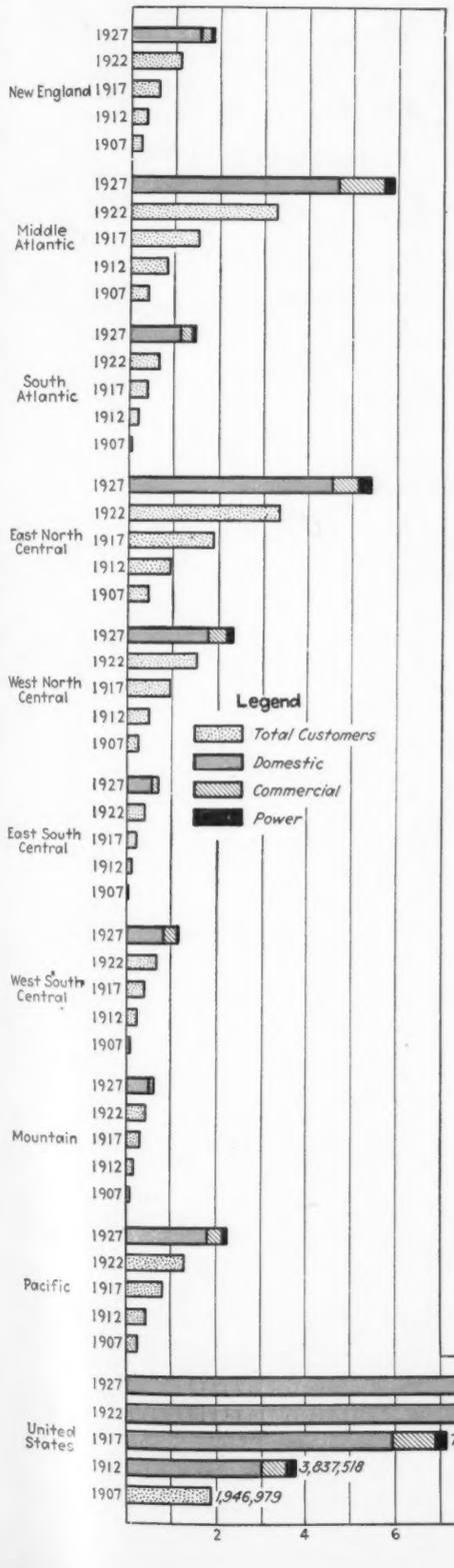
Purchase and agency are desired in Turin, Italy (No. 29,530), for air compressors, all types.

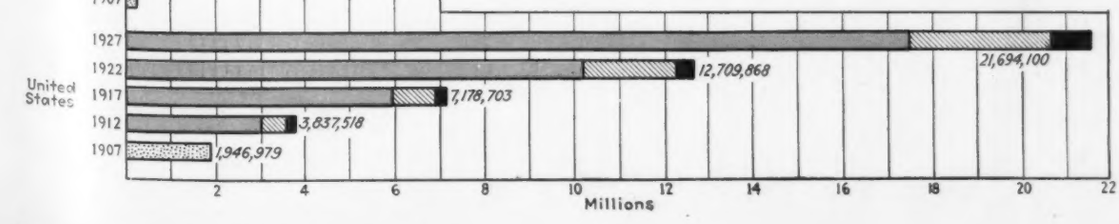
Purchase is desired in Dresden, Germany (No. 29,602), of furnace control instruments.

An agency is desired in São Paulo, Brazil (No. 29,514), for pumps, centrifugal and turbine outfits and smaller water turbines.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business





Customers by geographical divisions

The South's Rapid Increase in Customers

LIKE every other measure of the growth in the use of electricity in the United States, the number of consumers has shown an uninterrupted increase since the beginning of incandescent lighting, about 45 years ago. The first recorded count on a national basis was that of the census of electric light and power companies in 1907, a quarter of a century after the erection of the first plant. The number reported for that date was 1,946,979. Five years later it had increased by 97 per cent; the number added during the half decade ended with 1912 lacked but a trifle of being equal to the entire clientele acquired during all previous years. From 1912 to 1917 there was another huge increase, far greater numerically than between 1907 and 1912, but the ratio was somewhat smaller; it amounted to 87 per cent. This condition has continued: each five-year gain has been larger numerically but smaller in percentage than the one before; from 1917 to 1922 it was 77 per cent, and from 1922 to 1927 it was 71 per cent. Thus as the residential users, who constitute about four-fifths of the entire number, come to approach—and in some localities to exceed—the number of families, it is to be expected that the increase will occur in successively smaller steps, not only relatively but absolutely. This apparently is already happening; for the past two or three years the annual gains, as closely as they could be determined by a careful survey, have been growing smaller. This is not surprising in view of the circumstance that the residential customers are already 63 per cent as numerous as the families in the United States as a whole, and in certain regions greatly exceed that ratio.

It follows that while there was more than a tenfold increase during the past twenty years it would seem preposterous to expect a corresponding growth during the next twenty years. Growth there will certainly be; growth in connected load, but it must come increasingly in the form of larger average loads rather than from great numbers of new customers.

The national movement has been essentially paralleled in the several regions and in individual states, though with local variations. The sections that were early developed electrically, in particular the older industrial sections, had their most rapid increase in customers during the earlier part of the period under review, while the newer industrial areas, with their recent rapid increase in facilities, in plant and in energy sales for manufacturing or for the production of raw materials, show maximum customer growth in the later years.

INCREASE IN NUMBER OF CUSTOMERS IN PER CENT BY FIVE-YEAR PERIODS

	1906 to 1912	1912 to 1917	1917 to 1922	1922 to 1927
New England	93	107	77	69
Middle Atlantic	95	85	112	83
South Atlantic	107	85	93	115
East North Central	93	100	79	63
West North Central	91	119	58	43
East South Central	51	72	90	91
West South Central	91	67	62	93
Mountain	70	85	32	37
Pacific	95	61	71	67
United States	97	87	77	71

Still reckoning in percentages, by which the changes are more strikingly reflected than by the actual numbers, it is seen from the accompanying table that whereas New England, the North Central States—both East and West—the Mountain and the Pacific States had reached their peak customer growth by 1917, the middle Atlantic region did not reach it until the period including the later war and early post-war years. The entire South made greater gains in the past five years than in any earlier equal period.

1927 Industrial Operations in the New England States 3 Per Cent Over 1926

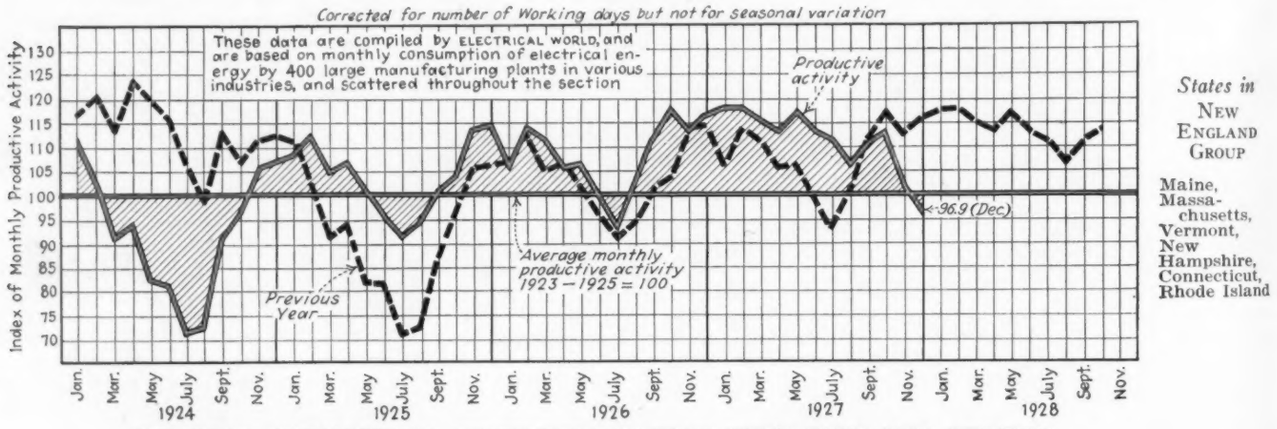
REPORTS on the consumption of electrical energy by the manufacturing plants operating in the New England States indicate this was one of the few sections of the nation witnessing increased general industrial operations during 1927 as a whole, with an average monthly rate 2.9 per cent over 1926. This favorable condition was largely due to continued high rates of activity of the textile mills during the first ten months, reaching the peak in July, when operations were about 20 per cent over those recorded during July, 1926. The year closed, however, with textile operations about 19 per cent under July and 22 per cent under December, 1926, which influence resulted in an index of general industry during December about 17 per cent under December, 1926.

Indexes of Productive Activity in the New England States
(All Figures Adjusted for Number of Working Days)

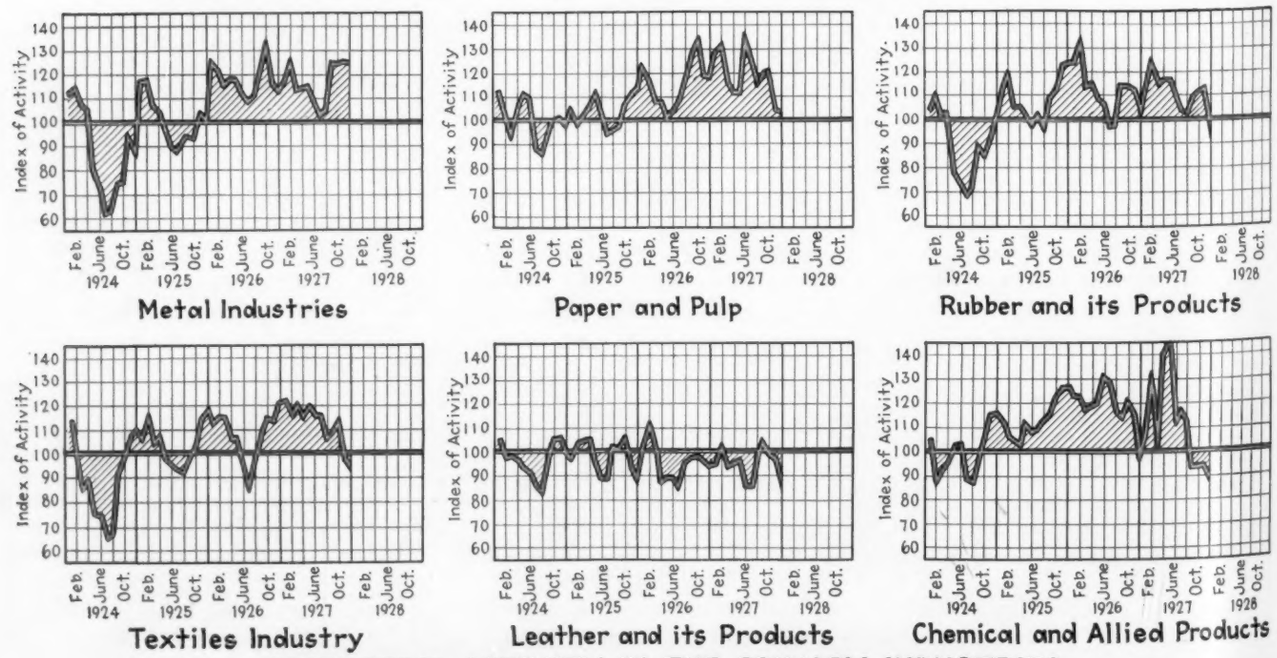
	Dec., 1927	Nov., 1927	Dec., 1926	Average for Full Year 1927	Average for Full Year 1926
All industries	96.9	101.2	116.0	111.0	107.8
Chemical and allied products	88.8	92.2	97.8	112.6	118.7
Leather and its products	87.8	98.0	93.7	95.0	96.0
Lumber and its products	87.0	114.5	.....	.....	.....
Metal industries group	124.2	125.3	113.0	117.2	117.8
Paper and pulp	100.9	102.1	118.2	117.8	115.5
Rubber and its products	93.2	112.0	101.5	110.7	111.5
Textiles	94.2	99.0	120.6	112.4	107.4

Compared with 1926 only two of the primary industrial groups—textiles and paper and pulp—reported a higher monthly average and only one—metals—closed the year 1927 on a higher plane. So that while the average monthly operations of New England industry as a whole during 1927 were over those of 1926, conditions in many of the individual industries during a large portion of the year were far from satisfactory.

ELECTRICAL WORLD *Barometer of Industrial Activity in the New England States*


Corrected for number of Working days but not for seasonal variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 400 large manufacturing plants in various industries, and scattered throughout the section
Productive activity
96.9 (Dec.)
Average monthly productive activity 1923 – 1925 = 100
Previous Year
Index of Monthly Productive Activity
States in NEW ENGLAND GROUP
Maine, Massachusetts, Vermont, New Hampshire, Connecticut, Rhode Island
1924
1925
1926
1927
1928

GENERAL INDUSTRIAL ACTIVITY IN THE NEW ENGLAND STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE NEW ENGLAND STATES